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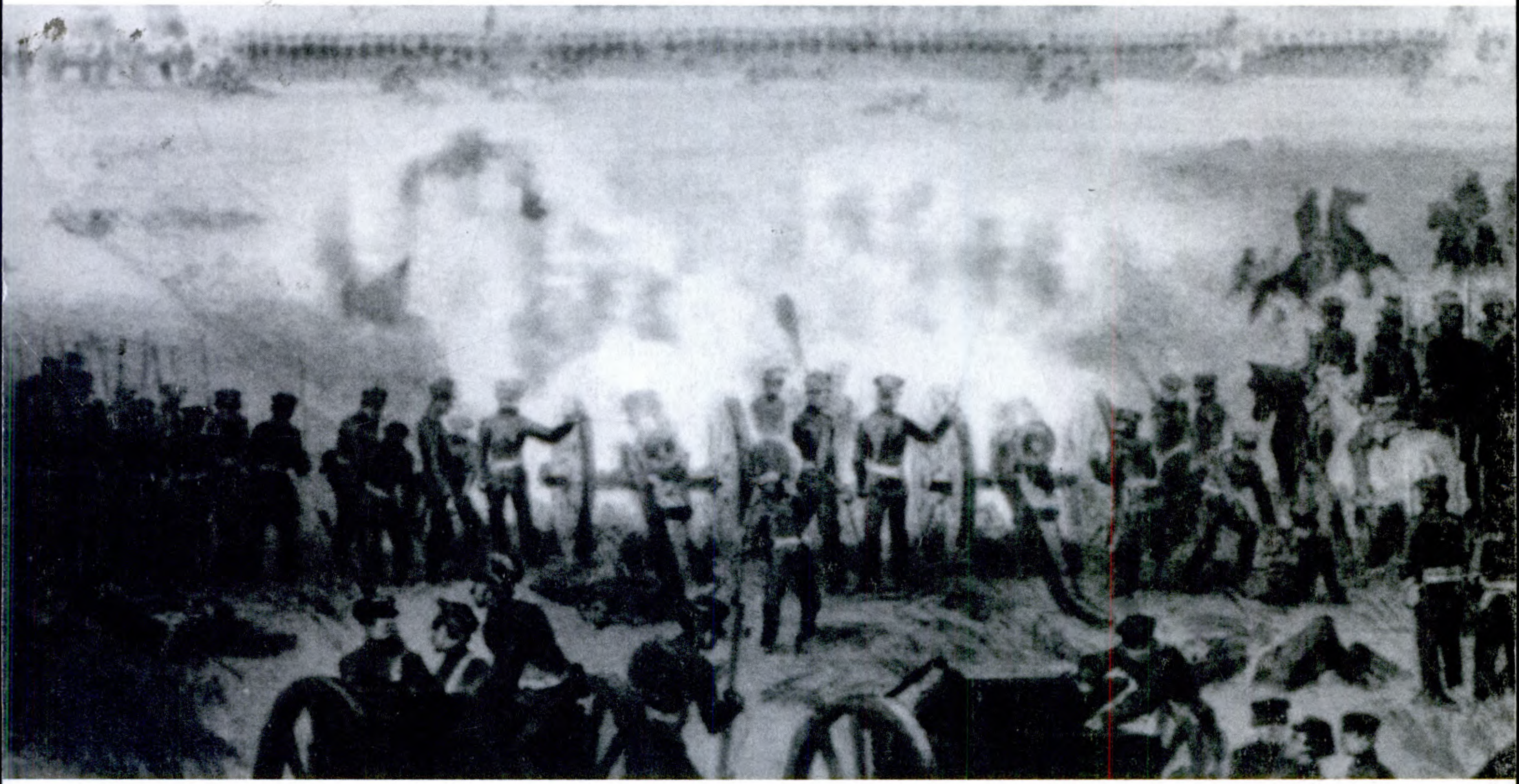
DIVISIONS OF ANTHROPOLOGY AND HISTORY

A THUNDER OF CANNON

ARCHEOLOGY OF THE MEXICAN-AMERICAN WAR BATTLEFIELD OF PALO ALTO



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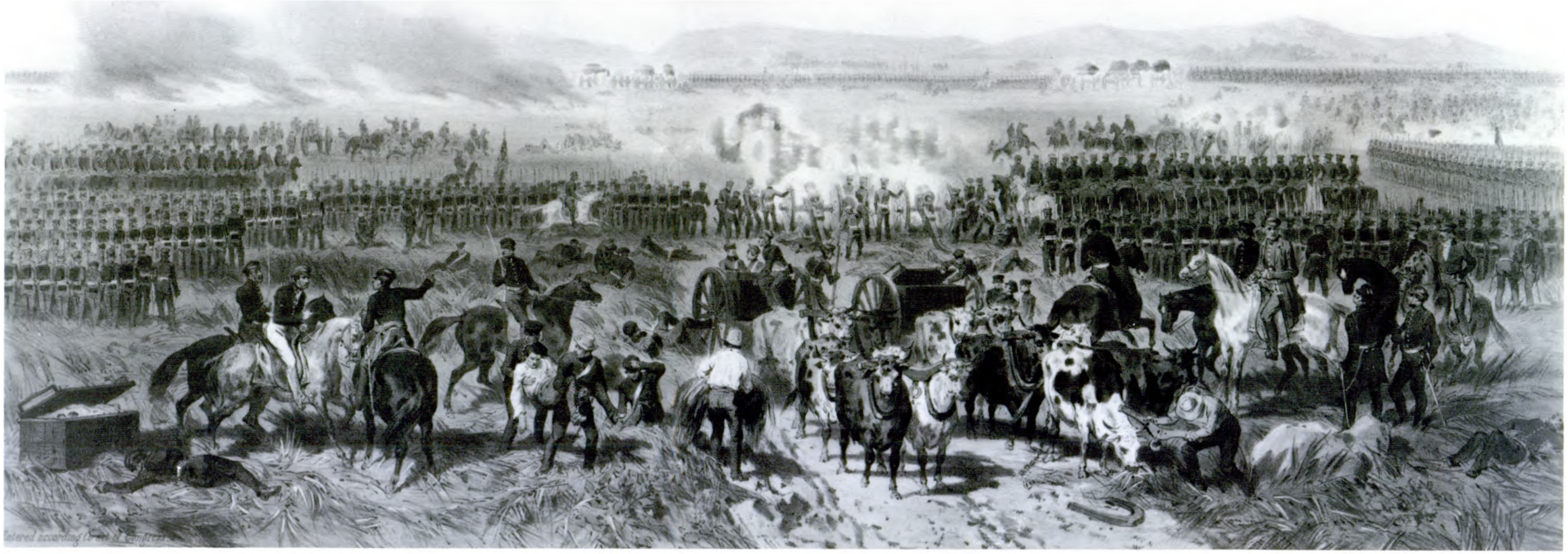

Frontispiece. "The Battle of Palo Alto", ca. 1846 lithograph by Carl Nebel. The hills seen on the horizon do not exist in reality--the region surrounding the battlefield, like the battlefield itself, is virtually flat. The battle scene is the U.S. army, looking toward the Mexican battle line to the south. Photo of lithograph courtesy U.S. Library of Congress.

A THUNDER OF CANNON

ARCHEOLOGY OF THE MEXICAN-AMERICAN WAR BATTLEFIELD OF PALO ALTO

CHARLES M. HAECKER

With Contributions By

Michael Farmer
Eric A. Ratliff
Norman L. Richard
Dr. Alfred T. Richardson
Kevin R. Young

National Park Service - Divisions of Anthropology And History
Southwest Regional Office
Santa Fe, New Mexico

SOUTHWEST CULTURAL RESOURCES CENTER
PROFESSIONAL PAPERS NO. 52
1994

To

Jack and Mary Haecker

ABSTRACT

Palo Alto battlefield is the site of the first major engagement between the forces of Mexico and United States during the Mexican-American War. The May 8, 1846 battle was the first between the United States and a foreign power since the War of 1812. In addition, it was the first major test of graduates of the United States Military Academy against a foreign army. Of all Mexican-American War battlefields on United States soil (Texas, California, and Mexico), Palo Alto is the only one that has retained its general physical and visual integrity. Because of its historical significance, Palo Alto Battlefield NHS was established June 23, 1992, when the Palo Alto Battlefield National Historic Site Act (P.L. 102-304) established a 3,400-acre national historic site.

As part of the planning process for the new park, the National Park Service authorized an archeological sample survey of the battlefield as a follow-up to a 1979 preliminary archeological investigation of Palo Alto. The resultant 1992 and 1993 archeological surveys, conjoined with documentary research, have contributed information needed for the general management plan of the park. In addition, the synthesis of archeological and documentary materials derived from this investigation has produced interesting, sometimes even surprising, insights into the actual conduct of this battle. Recommendations for future work within the park are also presented.

ACKNOWLEDGEMENTS

This project involved the cooperative efforts of many people, and the resulting report would have been inadequate without their interest, expertise and very active support. I would like to express my appreciation to those listed below for their particular contributions.

With the National Park Service Regional Office in Santa Fe, I thank now-retired Regional Archeologist Ronald Ice, Regional Archeologist Larry Nordby, and Associate Regional Director Richard Smith for their direction and encouragement. I am also indebted to: Division of Anthropology Archeologist Jim Bradford, for whose patience, expertise and insights I greatly appreciate; Regional Historian Neil Mangum, who made a number of useful observations and reviewed the report draft; the Division of History also contributed funds toward the publication of this report. I thank Carmen Silva for her exacting line drawings; Division's Scientific Illustrator Jerry Livingston, who produced meticulous artifact photographs; and to Cultural Resources Assistant Rose Ortiz, and Editorial Assistant Sarah Chavez, who were assigned the difficult task of converting drafts into a presentable document.

I also acknowldege the expertise contributed by Remote Sensing Archeologist Art Ireland and his assistant Ron Brown, who, together, provided data control points required for piece plotting the artifacts. Deborah King supervised the artifact curation, and was assisted by Kim Lennox and Heather Young. Ms. Young also conducted in-field artifact curation during the 1993 field season.

Many people from the Brownsville area made significant contributions. I would like to thank Palo Alto Battlefield National Historic Site Superintendent Tom Carroll for his unstinting support during and after the fieldwork phase of the project including his contribution of park funds towards report publication. Tom, together with Park Historian Dr. Aaron Mahr, took time from their busy schedules to carefully review and comment on the report drafts. Bruce Aiken, Executive Director, Historic Brownsville Museum, shared his extensive knowledge of the region's history. Dr. Anthony Zavaleta, Dean, College of Liberal Arts, University of Texas at Brownsville, and Tom Fort, Assistant Director, Hidalgo County Historical Museum likewise provided their valuable insights. Palo Alto Battlefield Chairman Walter E. Plitt III shared his intimate familiarity of Palo Alto battlefield and battle history; both he and his wife Molly also were liberal with their Texan hospitality.

Special appreciation is extended to Dr. Vidal Longoria, Emilio Sanchez, Kay Evanoff, Bert Wheeler and Francille Dudley. These five individuals gave their permission to the National Park Service for conducting the archeological survey on their properties as well as loaning the recovered artifacts for study. Without their essential cooperation, this project would have ceased to exist at its inception.

Dr. Alfred Richardson and Norman Richard, professors of Biological Sciences, University of Texas at Brownsville, conducted exhaustive faunal and floral studies of Palo Alto battlefield. Michael Farmer, National Audubon Society, likewise made a natural resources survey of the battlefield. These three individuals also are the major contributors to the Environmental chapter of this report. Two other individuals contributed Appendices B and C of this report: Eric Ratliff (Appendix B); and Kevin Young (Appendix C). Dr. David Flory, a physician for Baptist Hospital in Harlingen, Texas, analyzed human bone recovered from the battlefield.

Not enough praise can be given to the good-natured field crew members who, as a group, contributed many hundreds of hours under a merciless Texas sun. T.G. Futch and Melissa Payne were my able assistants during the 1992 and 1993 field seasons, respectively. Volunteers included Cecil Allison, Bob Anderson, Rod Bates, Gary Chauvin, Robert Garcia, David Gray, David Martinez, Dr. Jeffrey Mauck, Paul Mitchell, James and Grace Pointinger, Stosh Prukop and Robert Zamarripa. Special thanks to each of you for your friendship and tolerance of my bad puns.

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Charles M. Haecker
Santa Fe
1994

TABLE OF CONTENTS

ABSTRACT vii

LIST OF FIGURES xv

ACKNOWLEDGEMENTS ix

1. INTRODUCTION 1
    - Park Purpose 1
    - Archeological Investigations at Palo Alto 4

2. ENVIRONMENT 7
    - General Ecology 7
    - Soils of Palo Alto 8
        - Salt Prairie Soils 8
        - Levee Soils 8
        - Transition Soils 8
    - Wetlands 8
    - Vegetation 11
        - Tamaulipan Brushland 11
        - Salt Prairie 13
    - Wildlife 15
        - Tamaulipan Brushland 16
        - Salt Prairie 16
        - Wetlands 16

3. HISTORICAL OVERVIEW 17
    - Taylor's Army of Occupation: Corpus Christi 17
    - Prelude to War 18
    - The Battle of Palo Alto 23
    - Post-Battle History 37
        - May 9, 1846 To May 8, 1893 37
        - Post-1893 To The Present 40
        - Recent Research 41

4. WEAPONS, ACCOUTERMENTS AND THE SOLDIER 45
    - Mexican Firearms 45
        - India Pattern Musket 45
        - Baker Rifle 47

        Paget Carbine 48
        Escopeta 48
        Pistols, U.S. and Mexican 48
    U.S. Firearms 51
        Models 1816/1822 and 1835 Muskets 51
        Shotgun 54
        Hall Rifle 54
    Weapons of the Texas Volunteers 55
    Edged Weapons 58
        Bayonet 58
        The Lance 58
        Swords 59
    Cannon and Cannoneers 60
        Round Shot 60
        Shell 62
        Spherical Case 64
        Canister 64
        Grapeshot 65
    U.S. Artillery 65
    Mexican Artillery 68
    Uniforms, Accouterments and the Soldier 68
        U.S. Army 68
        The U.S. Soldier 70
        The Mexican Soldier 71
    Tactics 74
        Line Formation 74
        Column Formation 75
        Skirmishers 75
        Square Formation 75

5. DOCUMENTARY ANALYSES 77
    Historic Maps 78
        The Berlandier Sketches 78
        The American Maps 85
        Lieutenant Scarritt's Sketches 88
    Aerial Photographs 92
        Palo Alto Pond (Area A) 92
        Matamoros/Point Isabel Road Segment (Area B) 92
        The Resaca (Area C) 93
        Tanques del Ramireño Road (Area D) 93
        Motitas (Area E) 93
        Marshy Area (Area F) 93
        Lomas Tendidas (Area G) 94

6. ARCHEOLOGICAL FIELD RESEARCH METHODS 95
        Research Proposal 95
        Proposed Investigative Theory and Practices 95
        Military Equipment and Archeological Expectations 95

United States Arms and Equipment 96
Mexican Arms and Equipment 96
Testable Assumptions: Battlefield Locations 97
Proposed Field Methods 98
Orientation 98
Survey 99
Recordation and Collection 99
Laboratory Methods 100
Applied Field Methods of the 1992, 1993 Field Seasons 100
Orientation 100
1992 and 1993 Surveys 100
1993 Survey Methods 105

7. ARTIFACT DESCRIPTIONS AND ANALYSES 107
Artillery and Firearm Ammunition 107
Lead Balls, General 107
Lead Balls From Palo Alto Battlefield 109
Spherical Case and Shell 115
U.S. Iron Shot 118
Mexican Cupreous and Lead Shot 119
Solid Shot/Cannon Balls 120
Iron Cannon Balls 120
Cupreous Cannon Balls 121
Firearms Parts 122
Edged Weapons 129
Buckles 129
Buttons 133
Uniform Brass and Accouterments 136
Personal Possessions 140
Farriery and Horse Tack 143
Hardware 145
Miscellaneous Artifacts 149
Bone, Human 149

8. CONCLUSION 151
Recommendations 154

REFERENCES CITED 157

APPENDIX A- Glossary of Terms 179

APPENDIX B- Human Skeletal Remains from the Battle of Resaca de la Palma
Eric A. Ratliff 189

APPENDIX C- Finding a Face: El Soldado Mexicano 1835-1848
Kevin R. Young 209

INDEX 219

LIST OF FIGURES

1. Region map 2
2. Vicinity map 3
3. Aerial photograph of Palo Alto Battlefield (pocket insert)
4. Soil map of Palo Alto Battlefield NHS 9
5. Major wetlands 10
6. Map of brushlands, Palo Alto Battlefield National Historic Site 12
7. Mixed Salt-Borrichia Prairies 14
8. Burning off of mixed cordgrass-mesquite 15
9. Map showing the vicinity around Palo Alto at time of battle 21
10. Initial battle lines around 1 P.M. 25
11. A *Cazadore* in action at Palo Alto 28
12. Mexican Fourth line regiment, under artillery attack 30
13. Battle lines, approximately 2-4 P.M. 32
14. Final battle lines, approximately 5-7 P.M. 35
15. Lieutenant Scarritt's sketch of earthen fortification 37
16. India Pattern "Brown Bess" musket 46
17. U.S. Model 1836 flintlock pistol 49
18. U.S. Model 1842 percussion cap pistol 50

19. U.S. Model 1816 flintlock musket 52
20. U.S. Model 1835 flintlock musket 53
21. U.S. Model 1835 flintlock musket. 56
22. Ammunition for smoothbore artillery 61
23a. Trajectory of a solid round 63
23b. Problems in firing spherical case shot 63
24. U.S. fieldpiece 67
25. Mexican fieldpiece 69
26. Berlandier's first sketch map of the battle 79
27. Berlandier's second sketch of the battle 80
28. Mexican battle map (Map A) (1846). 82
29. Ramsey's map (1850) 83
30. Stewart's map (Map D) (1887) 84
31. Henry's map (Map B) (1847) 86
32. Dobbins' map (Map C) (1846) 87
33. Lieutenant Scarritt's first sketch 89
34. Lieutenant Scarritt's second sketch 90
35. Lieutenant Scarritt's third sketch 91
36. Metal detector survey of plowed field 102
37. Metal detector survey in vegetated field 103
38. In situ Mexican cannon ball 104
39. Survey areas (pocket insert)
40. Metal detector survey of SA 308 105
41. Artifact distribution (pocket insert)

42. Lead balls 110
43. Lead ball patterning within SA 209 112
44. Cannon shot and shell fragments 116
45. Cannon balls 121
46 Firearm parts 123
47. Trigger guard parts of an India Pattern musket 124
48. Paget carbine 126
49. Second pipe, India Pattern musket 126
50. Terminal ramrod pipe, India Pattern musket 127
51. Butt plate, India Pattern musket 128
52. Side plate, India Pattern musket 128
53. *Briquet* sword hilt, from Mexican battle line 130
54. Intact *briquet* sword hilt 130
55. Buckles 131
56. Buttons 134
57. Uniform brass and accouterments 137
58. Personal possessions. 141
59. Personal possessions, wine bottle fragments 142
60. Farriery and horse tack 144
61. Mexican bridle 146
62. *Coscojo* 146
63. Hardware 147
64. Battle map of Resaca de la Palma 191
65. Skeletal remains, from Mexican mass burial at Resaca de la Palma 193

66. Bone buttons, from mass burial at Resaca de la Palma 195

67. Tibia of RES 15 from mass burial, showing imbedded lead ball 199

68. Humerus of RES 28, showing sword or bayonet cut 200

CHAPTER ONE

INTRODUCTION

The Battle of Palo Alto, fought on May 8, 1846, was the first of many battles in the Mexican-American War, termed by Mexico as the War of North American Intervention. Palo Alto bears historical and national significance for both countries in that it was the first battle of the war, initiating a chain of events changing the course of history of both nations. For Mexico, the battle meant the loss of sovereignty of its northern frontier, and eventual defeat meant losing approximately one-half of its country. Mexico's loss also resulted in decades of ensuing political turmoil within Mexico, as reflected by: the eventual end of the Santa Anna era; subjugation to the foreign emperor Maximilian; rebuilding of the country by Juarez; a long period of dictatorship under Díaz; and revolutions during the early twentieth century.

For the United States, the Mexican-American War occupies an ambiguous place in its national historical consciousness. Depending on the prevailing mood of intellectuals and historians, it was either denounced as a wicked war of aggression against a weaker neighbor or justified as an inevitable phase in the expansion of a vigorous nation. Perhaps because of this ambiguity, Americans are unclear as to the purpose of this war, and, consequently, there is relatively little interest in its events. This obscurity is undeserved since the Mexican-American War was an important episode in our military and general history. Regarding nineteenth century warfare, this conflict resulted in a number of military innovations and significant lessons in strategy. In the context of general history, the war was important because of its results--over one million square miles of territory were added to the United States. The acquisition of the new lands eventually strengthened the nation, but the immediate effect caused internal division and weakened the ties of union. The area secured from Mexico became a prize of contention between the North and the South, between the forces of slavery and antislavery, a struggle that led inexorably toward a greater conflict, the Civil War.

Park Purpose

To recognize both the significance of this battle and the Mexican-American War as a whole, Congress authorized the establishment of a park unit two miles north of the city limits of Brownsville, Texas (Figures 1 and 2). Palo Alto Battlefield National Historic Site (NHS) is the only unit in the National Park Service system providing preservation and interpretation of resources related to the Mexican-American War. The two Acts of Congress establishing and enlarging the Palo Alto Battlefield NHS address preservation and interpretation of its historic resources and set out requirements for management of the area. Congress authorized this in 1978 (P.L. 95-625) to "preserve and commemorate...an area of unique historical significance..." The authorization further required a feasibility study on the acquisition of additional, adjacent lands that would fully protect the historical integrity of the battlefield. Thus, the Palo Alto Battlefield NH Site Act of 1991 (P.L. 102-304) established a 3,400 acre site for the Palo Alto Battlefield NHS on June 23, 1992.

Section 3(a) of the above law further defined the purpose of this national historic site:

> In order to preserve for the education, benefit, and inspiration of present and future generations the nationally significant site of the first battle of the Mexican-American War, and to provide for its interpretation in such a manner as to portray the political, diplomatic, military, and social causes and consequences, there is hereby established the Palo Alto Battlefield Historic Site...In furtherance of the purposes of this Act, the

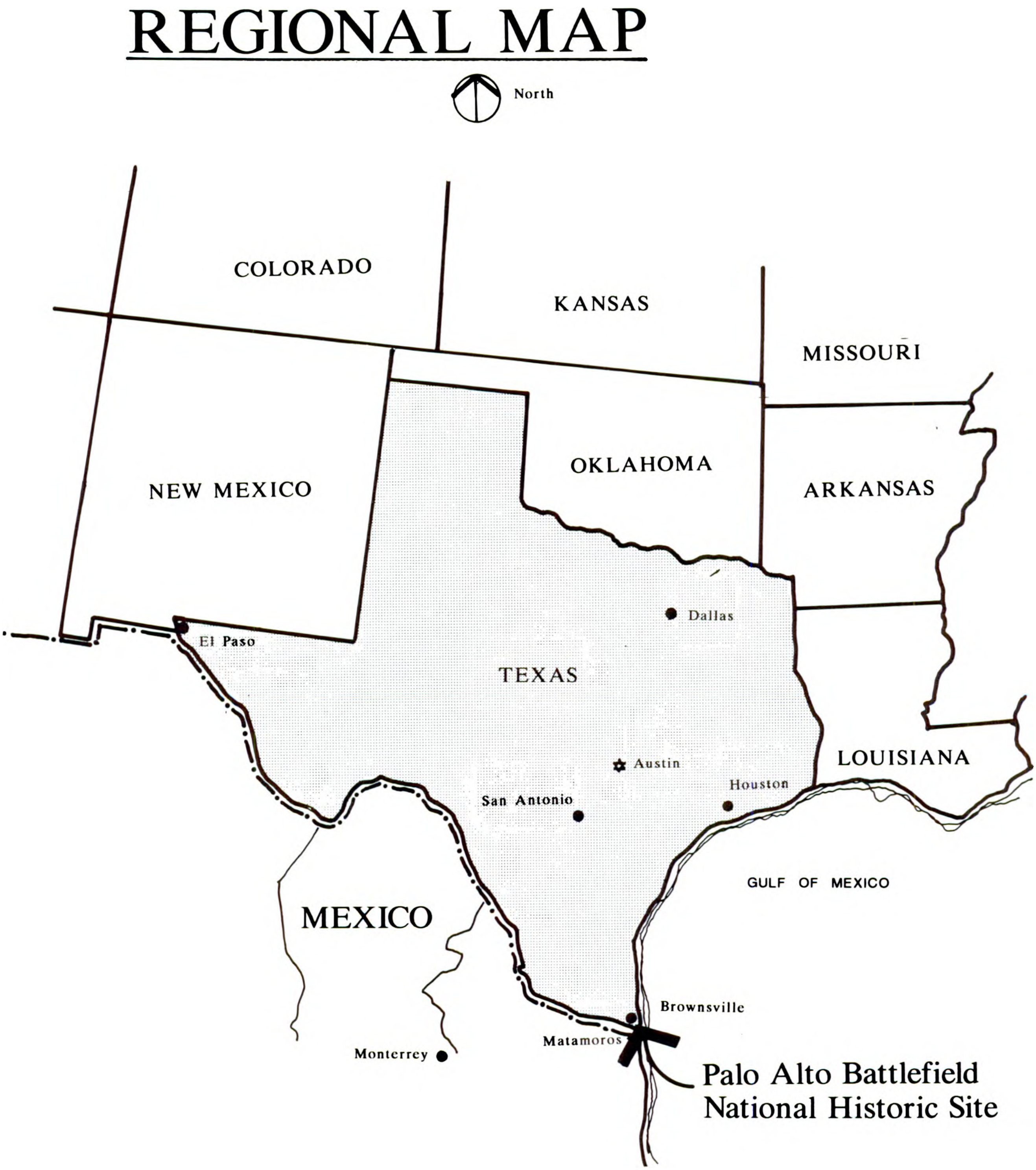
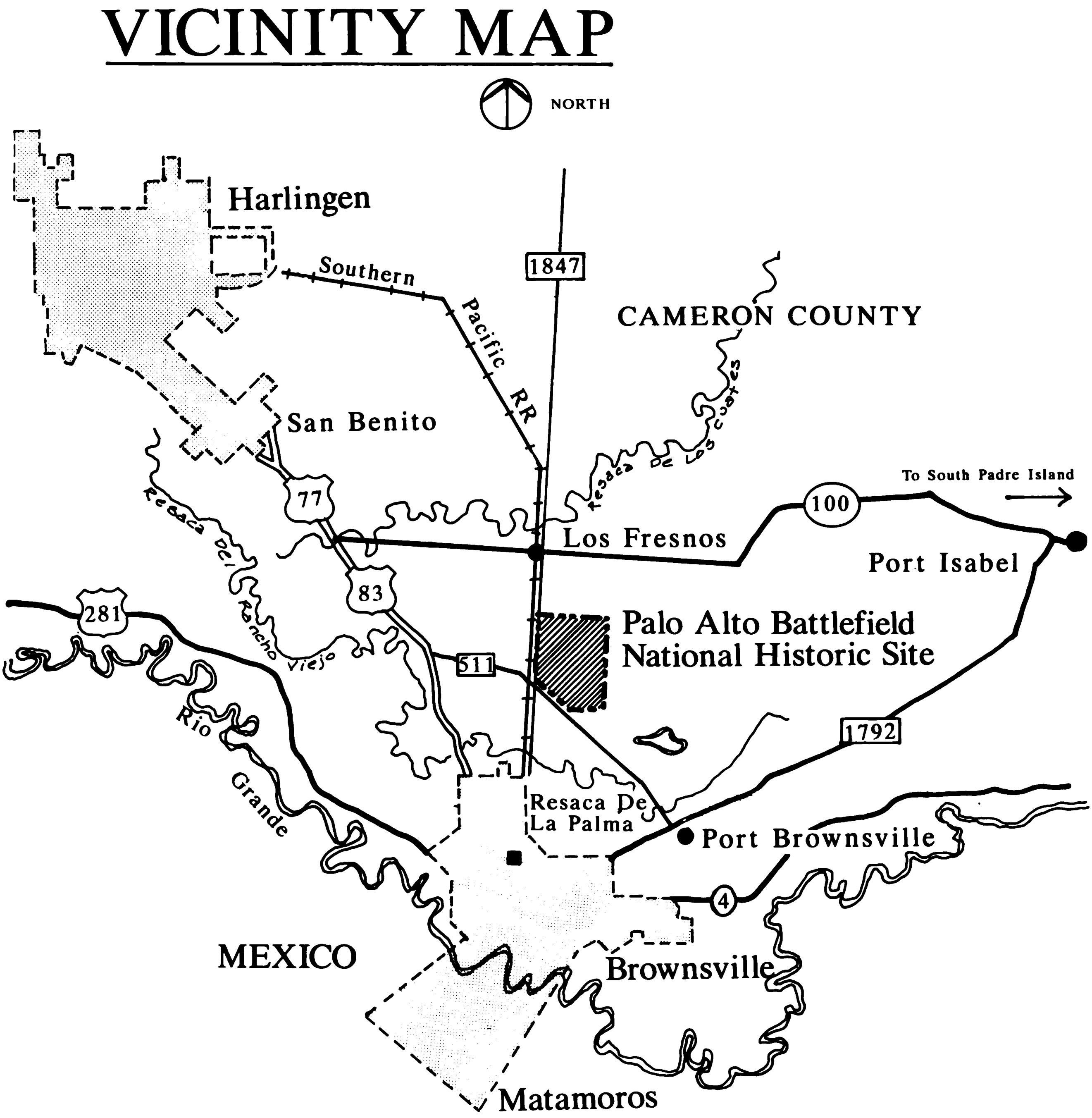

REGIONAL MAP
North
COLORADO
KANSAS
MISSOURI
NEW MEXICO
OKLAHOMA
ARKANSAS
El Paso
Dallas
TEXAS
LOUISIANA
Austin
Houston
San Antonio
GULF OF MEXICO
MEXICO
Brownsville
Matamoros
Monterrey
Palo Alto Battlefield
National Historic Site

Figure 1. Regional map showing the location of Palo Alto Battlefield NHS in Texas.



VICINITY MAP

NORTH
Harlingen
Southern Pacific RR
1847
CAMERON COUNTY
Resaca De Los Cuates
San Benito
To South Padre Island
100
77
Los Fresnos
Port Isabel
Resaca Del Rancho Viejo
83
281
Palo Alto Battlefield National Historic Site
511
Rio Grande
1792
Resaca De La Palma
Port Brownsville
4
MEXICO
Brownsville
Matamoros

Figure 2. Vicinity map showing the location of Palo Alto Battlefield NHS in South Texas.

> Secretary is authorized to enter into cooperative agreements with the United States of Mexico...and with owners of Mexican-American War properties within the United States of America for the purposes of conducting joint research and interpretive planning for the historic site and related Mexican-American War sites. Interpretive information and programs shall reflect historical data and perspectives of both countries and the series of events associated with the Mexican-American War.

The NPS includes archeological investigations as part of its development policy involving "studies, plans, and actions to accompany or precede park development, and to be part of a comprehensive planning sequence" (NPS 1980:1-3). A natural adjunct to the archeological study of Palo Alto is in-depth and ongoing historical research. Battlefield interpretation based on historical accuracy is essential not only to provide a sound plan for park management but also for addressing issues of cultural and national sensitivities. The park purpose requires "...its interpretation in such a manner as to portray the battle and the Mexican-American War and its related political, diplomatic, military, and social causes and consequences" (NPS 1992:2).

Archeological Investigations at Palo Alto

Archeologically productive sites are part of our common cultural heritage. Some sites are significant primarily on the local level, the integral parts of the history of a community; some reflect the roots of that community and the stages through which it evolved. Other sites are of statewide importance, reflecting trends and events that helped form the political, social and economic entity in which we live. Relatively few sites can be viewed as a part of our shared national heritage. Certainly, the event that took place at Palo Alto on May 8, 1846, meets all of the above levels of significance.

Until recently, battlefields were rarely investigated by an historical archeologist. Perhaps this bias against such investigation is partly based on the belief, once expressed by Noël Hume (1969), that "little can usefully be said about battlefield sites...[where]...the salvage of relics becomes the be all and end all". If, indeed, a battlefield is nothing but a repository of random, rusting relics, then avoidance by the serious researcher is probably correct. Implicit in this line of reasoning is the assumption that archived documents and various other historical records sufficiently meet the needs of the interested historian.

Since the 1980s, there has been an upsurge of interest in this formerly neglected field of archeological research. For example, noted issues of concern in a Society of Historical Archeology newsletter include: strategies for battlefields protection; a planned symposium dealing with combat sites; and a request for data on artifact distribution patterns on Civil War battlefields (SHA Newsletter 1993:16-18). Obviously, archeological investigations of battlefields can provide interpretative data unobtainable from documents.

As one might expect, participants in a battle can have different views and interpretations of the events and actions. Fortunately, these differing historical accounts of a battle, and the interpretations of these accounts by historians, can be regarded by the historical archeologist as sources of alternate hypotheses with archeological evidence used to test each alternative (Gould 1983:118). Nevertheless, for mutual checks and balances to exist between historical archeology and history, the archeologist must first create an objective approach for analysis of the physical remains.

The basis for all archeological investigations is the axiom that objects are deposited in recognizable and interpretable patterns. In their investigation of the Little Bighorn battlefield, Scott et al. (1989:8) shaped their research objectives on the principle that "there exists a behavioral relationship between historical events and the physical remains of events...Behavior on the battlefield can be understood by exposing these relationships and evaluating them in historical contexts". Historical issues of the events of the Little Bighorn fight provided direction for this research, with the researchers' overriding goal of understanding battle events as represented by the archeological record. Ancillary research objectives of Scott et al., such as identification of armaments, equipment and human remains, were generated to identify behavioral relationships. For example, Scott et al., using modern firearm identification analysis applied in crime labs, identified specific battle activity areas based on the variety of armaments used at that fight. These procedures identified firearm types by determining ammunition calibers, distinguishing marks on metal cartridge cases, bullets, and firearm parts. In contrast with the combatants at Little Bighorn, those who fought at Palo Alto almost exactly 30 years earlier possessed a fundamentally different armaments system. Both the Americans and Mexicans employed cannon, and their firearms required paper, not metal, cartridges. In addition, this type of armaments system required a set of tactics different than those used at Little Bighorn. Therefore, a concomitant difference in artifact patterning would occur. Nevertheless, a fundamental similarity exists in the underlying research framework employed for both projects, that is, the translation of artifact patterning into behavioral dynamics.

The overriding goal of the 1992-1993 Palo Alto battlefield investigations was to obtain enough archeological data to determine major battle line positions taken by the two opposing armies. Consequent investigative goals include:

1) a comprehensive search for and the study of pertinent historical documents, including battle maps, and published and unpublished eyewitness accounts. A synthesis of the data would be used for comparison with archeological data;

2) correlation of specific topographic features described at the time of battle with topographic features found on the battlefield today;

3) post-battle history of Palo Alto as it relates to topographic and artifact patterning modifications; and

4) detailed analyses of artifact types and patterns to provide a much-needed data base for future Mexican-American War studies. Notably, such analyses have some relevance for those investigating period battlefields associated with other wars.

Unfortunately, the process of degradation of this particular archeological resource began almost as soon as the smoke of battle cleared. Artifact removal accelerated during the last few decades, to the point where there was at one time a fear nothing of archeological value was left. We were pleasantly surprised to find this fear was unjustified. In fact, we now believe significant archeological information still survives, information that can fill in some of the blanks of history if retrieved under scientifically controlled conditions. Much may still be learned from the Palo Alto battlefield and, now that it is part of the NPS system, protection of this cultural resource is assured.

Two Notes of Consideration

1) This report follows Webster's New Universal Unabridged Dictionary, Second Edition, regarding usage of the word "army" in its capitalized and noncapitalized forms. When capitalized, "The Army" or "Regular Army" refers to a country's entire land forces organization of permanent, professionally trained troops. During the Mexican-American War, a period of national emergency for both Mexico and United States, the Regular Army of each country also included various units of semi- and nonprofessional citizen-soldiers. In noncapitalized form, "army" refers to a specific military unit, usually consisting of two or more subunits, together with auxillary troops. This is a field army. For example, the Mexican army at the battle of Palo Alto consisted of four infantry regiments, supported by cavalry and engineer battalions, artillery batteries, nonprofessional irregulars, a field hospital and baggage train. A field army, therefore, is a subset of the Regular Army.

2) The English system of measurement is used since this system was predominant in nineteenth century United States. The nineteenth century Mexican linear unit of measurement, the *vara*, was variable in length but comparable to 2.8 ft. For this report, the *vara* has been converted to English measurement, allowing for comparisons and avoiding possible confusion. However, when dealing with analytical measurement of human bone, as is done in Appendix B, both English and metric systems are employed jointly.

CHAPTER TWO

ENVIRONMENT

This chapter is a synopsis of two independently directed environmental studies of Palo Alto battlefield, both surveys conducted in 1992-1993. Mike Farmer (1992) of the National Audubon Society, and Norman Richard and Dr. Alfred Richardson (1993), the latter two of the Biology Department, University of Texas at Brownsville, performed these surveys. Together, the surveys focused on: 1) developing faunal and floral inventories, including identification of endangered and threatened species; 2) mapping vegetational associations; 3) assessing manmade impacts on the battlefield; and 4) extrapolating the location of topographic manmade features significant to the conduct of the battle, and the battlefield landscape as it may have appeared in 1846. A comprehensive listing of battlefield fauna and flora are available in the above two reports.

General Ecology

Palo Alto battlefield is on the southern tip of Texas, within the Lower Rio Grande Valley (LRGV). The LRGV is not a true valley but rather a flat delta of the Rio Grande. The Gulf of Mexico is 20 mi to the east of the battlefield and the U.S./Mexico boundary, the Rio Grande approximately 9 mi to the south. The area surrounding the battlefield is a flat, featureless plain, with elevations ranging from about 8 ft to just over 20 ft above sea level (Brown et al. 1980) (Figure 3, pocket insert).

The LRGV is semiarid and subtropical. Annual precipitation is about 25 inches at Brownsville; however, rainfall in the area has been described as both seasonally and annually erratic. Most rainfall occurs in August, September and October. The driest months are March and April. Temperatures range from an average low of 48° F in January to an average high of 97° F in July. Winds are from the southeast from March through November, with short-lived but strong northerly winds from December through February. These year-round winds often contribute to an overall dry climate and periods of significant droughts.

The Rio Grande has been the dominant active force in extreme south Texas since the Pleistocene. Approximately 30,000 years ago, the sea level began to drop, resulting in the eventual formation of a broad, deep valley. Beginning 18,000 years ago, when the sea level started to rise, the valley began to fill with both deltaic and estuarine deposits. During the last several thousand years, the LRGV became generally inactive due to a drier climate. Only hurricanes tend to break the cycle and bring in new soil deposits. As a result, the geology of the region consists of relict or periodically active environments.

Sediments beneath the battlefield are Holocene and Modern fluvial-deltaic. Holocene and Modern deposits are characterized by broad flood basins between inactive meander belts and distributary channels abandoned by the Rio Grande. These belts and channels are prominent features of the battlefield. Such features not filled by erosion locally are termed *resacas* rather than "oxbow lakes", the term commonly used for this feature in other regions of the United States (Brown et al. 1980). (The word resaca derives from the Spanish word *resacar*, meaning "to take back"). The resacas of Palo Alto battlefield are best described as intermittent or remnant. They are not maintained by any political entity such as a drainage or irrigation district. Such seasonal wetlands can be valuable for wildlife during times of rainfall and runoff. At regular intervals along much of their length, wetland obligate plants such as sedges and cattails are evident (Martin and Hehnke 1981:19-46).

Soils of Palo Alto

Palo Alto soils either are clay or clay loam. All of the soils are saline, with generally poor drainage formed on remnant flood basins between resacas. The relative impermeability of these soils, combined with naturally poor drainage, has resulted in periodic flooding. The resacas are generally of the same soil types as are the surrounding flood basin. Soils created on resaca flood plains primarily are over-bank silts and clays, and many river-created landforms on the battlefield are still evident. Erosion and agricultural land preparation obscure the undercut banks formed on the outside of meander beds and the point bars created on the inside curve of resacas. Resacas may be abandoned during periods of flooding, when the river cuts through a slough of a point bar or across the ends of a resaca, the ends commonly plugged with sediments. Eventually, erosion creates a meander scar in the landscape by filling in the old resaca bed. Palo Alto battlefield displays many such features attributed to the meanderings of the Rio Grande.

Battlefield soils, as labeled by the USDA Soil Conservation Service (Williams et al. 1977), are as follows (Figure 4):

Salt Prairie Soils

Benito Clay (BE); Lomalta Clay (LM); Latina Sandy Clay Loam (LK); and Sejita Clay Loam (SE). These are saline soils that dominate open, flat salt prairie. Very little woody vegetation can be supported by it. Runoff is slow or nonexistent due to level or even concave surfaces, the latter filling with water after heavy rainfall. In addition, hurricanes can push tidal waters onto the battlefield. The resacas are generally the same soil types as in the surrounding flood basin, and likewise hold water well and for some time after heavy storms.

Levee Soils

Laredo Silty Clay Loam (LAA). These sandier soils make up the low levees immediately adjacent to the resacas. They have moderate permeability and slow runoff. Slopes are generally low but can be convex. The levees are slightly higher than the surrounding Prairie soils (e.g., Area G, Figure 3). As a result, they drain better and have correspondingly less salinity, allowing for native brush vegetation to occur here.

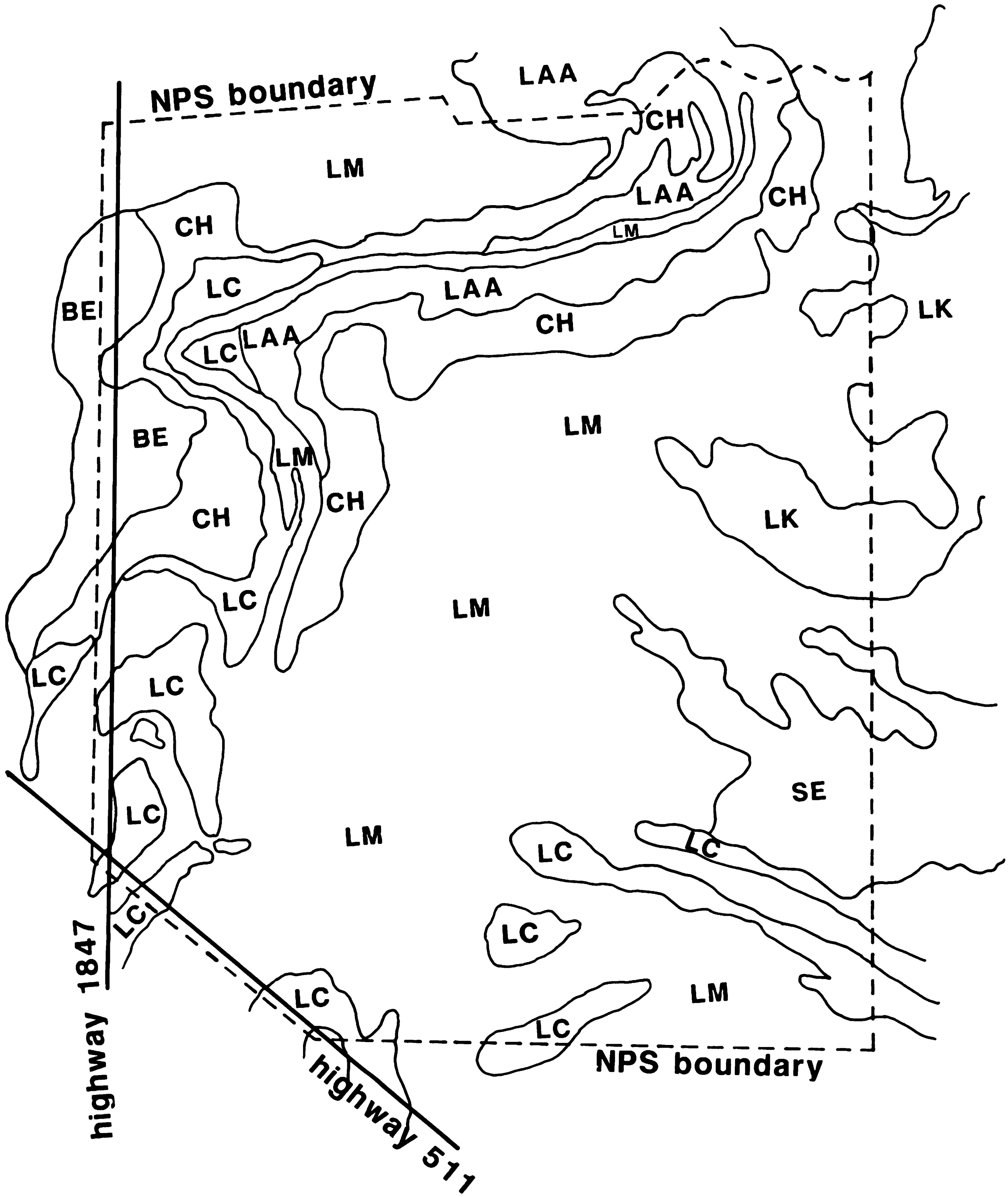
Transition Soils

Chargo Silty Clay (CH); Laredo Silty Clay Loam, saline (LC). These soils are also deposited adjacent to resacas. They are slightly higher than the Salt Prairie soils and, as a result, Transition Soils have a small slope or are convex. This allows for some runoff and leaching of salts down to the prairie. Some areas of these soils are high and drained enough to support dense brushland.

In some locations on the battlefield, the elimination of native vegetation, with its attendant erosion of higher soils onto the resacas, has begun obscuring the transition between the saline basins and the old resacas. Transitional soils, particularly type LC on the battlefield, can be indistinguishable, either by elevation or vegetation structure, from adjacent salt prairie. One landowner stated clearing for crops on some of his best land resulted in the filling of a resaca segment with an additional 4 ft of erosion material (Farmer 1992:5).

Wetlands

Wetlands consist of small, shallow segments of old resaca beds that retain water much of the year (Figure 5). For example, just before the heavy rains in June, 1993, most of these beds were dry and covered with grasses and a few shrubs. After the rains, much of the beds were covered with


NPS boundary
LAA
CH
LM
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NPS boundary
highway 1847
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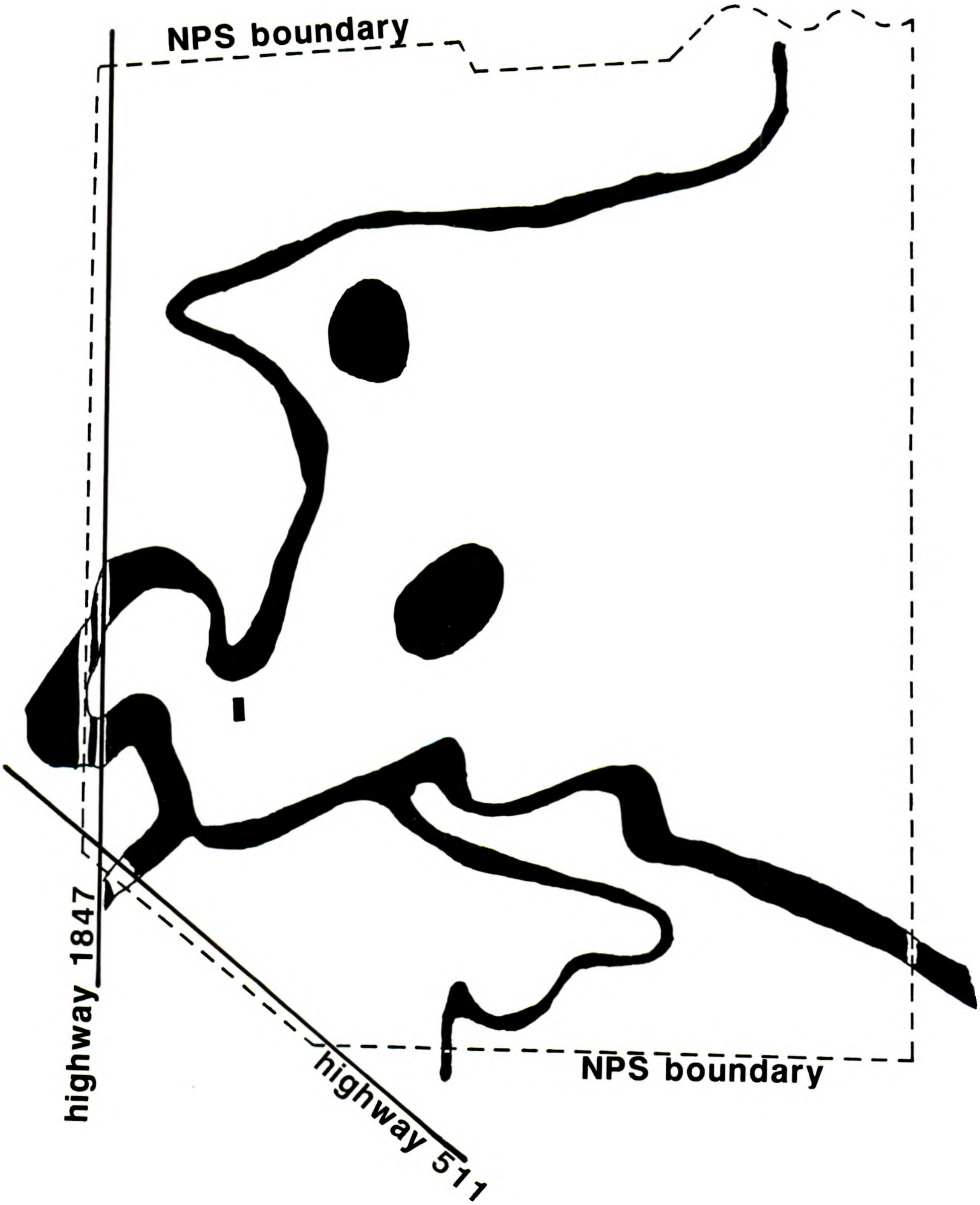
Figure 4. Soil map of Palo Alto Battlefield NHS, showing the Salt Prairie soils (LM, LK, BE, SE), Levee Soil (LAA), and Transitional soils (CH, LC).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highway 511
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Figure 5. The major wetlands of Palo Alto Battlefield NHS, consisting of Resaca de Palo Alto, Palo Alto Pond, old meander beds, and excavated ponds.

water. Several scattered cattle tanks are dug into old resaca beds, where natural drainage brings in water. Irrigation keeps water in some of the tanks during the absence of rain. Spoil dirt is piled on each side of the tanks, providing a habitat for mesquite and other Tamaulipan Brushland plants.

Based on a 1979 flood hazard boundary map, Richard and Richardson (1993) identify four flood hazard zones within Palo Alto battlefield, listed in descending order of potential flooding:

1) Resaca de Palo Alto (Area C, Figure 3);

2) the extreme northwestern portion of Palo Alto that was once a portion of an extensive, now-drained marsh named El Tule Grande;

3) substantial portions of the battlefield below 15 ft in elevation, and susceptible to inundations by 100- and 500-year floods. It includes two natural depressions significant to the battle: Palo Alto pond (Area A, Figure 3); and the northeast-southwest extending marshy area (Area F, Figure 3) believed to have been situated between the Mexican and U.S. battle lines. Water also is retained in these depressions after heavy rains; and

4) areas of minimal flooding, delimited by brushland, and generally following the 15 ft elevation contour line. A visible trace of the historic wagon road that bisected the battlefield (Area B, Figure 3) follows this elevation contour. Also protected from periodic battlefield flooding are the crests of clay-based dunes of 15-20 ft elevation, locally termed *motitas*. One battlefield *motita* (Area E, Figure 3) is named "Arista Hill", in the local belief General Mariano Arista, commander of the Mexican army at Palo Alto, viewed the battle from this elevation.

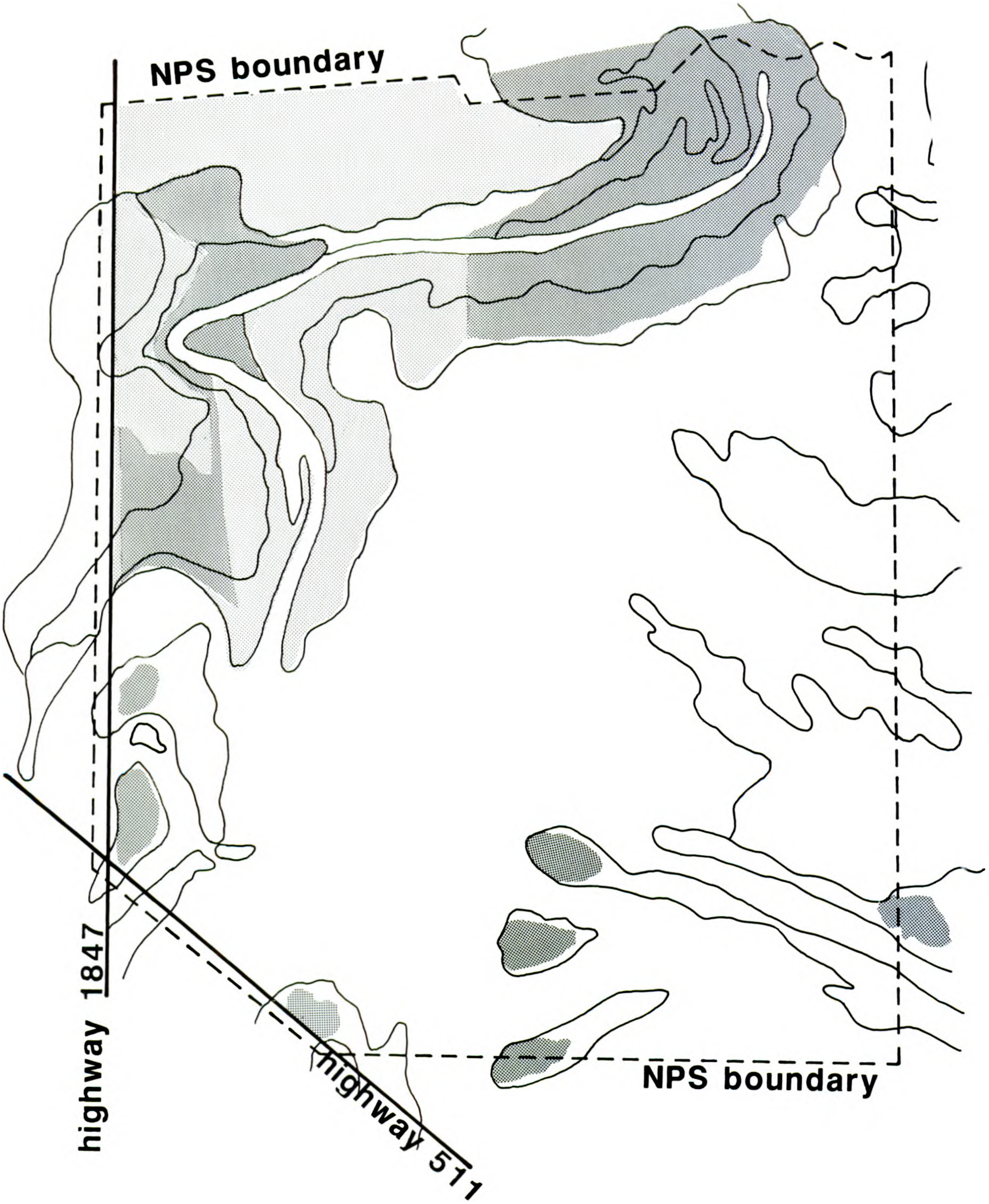
Vegetation

The LRGV, including Palo Alto battlefield, is wholly contained in the region known as the Matamoran district of the Tamaulipan biotic province. Much of the battlefield is an inland extension of the coastal prairie, interrupted in places by *motitas* less than 13 ft above sea level. The combination of climate, vegetation and wildlife is a unique blend of western desert, northern, coastal and tropical affinities. Many species of plants are endemic to the relatively small area of south Texas and northeast Mexico. Since rainfall is limited and irregularly distributed, there is little moisture available for plant growth. Thorny, small-leaved, drought-resistant plants are characteristic of the region. Plant distribution is principally influenced by soil types (edaphic) that, in turn, are correlated with geological formations (Johnson 1952; Johnson 1962; Jahrsdoerfer and Leslie 1988; Crosswhite 1980; Correll and Johnston 1970; Lonard et al. 1991).

A slight change in elevation on the battlefield, even when measured in inches, can affect the vegetation type. Palo Alto battlefield and the surrounding area contain a mix of two vegetation zones: Tamaulipan Brushland and Salt Prairie. These two major vegetation zones on the battlefield (Figure 6) are described as follows:

Tamaulipan Brushland

This vegetation zone is mostly found in Cameron County along the higher and better drained (thus less salty) soils on the edges of the resacas. Recent biotic inventories emphasized the region's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highway 1847
highway 511
NPS boundary

Figure 6. Dense brushland (dark shading), on the higher levee soils adjacent to the Resaca and old meanders. Plowed areas (light shading) are potential revegetation areas that should grow brush. Salt Prairies (unshaded areas) dominate.

dense brushland, the latter supporting several of the threatened or endangered animal species of the area. An estimated 95 percent of this original native brushland in the LRGV is now devoted to agricultural or urban use (Parvin 1988). Preservation and restoration of this unique habitat is presently a high priority of the U.S. Fish and Wildlife Service and also the target of numerous state and private efforts.

Tamaulipan Brushland covers approximately 23 percent of the battlefield surface area, primarily on soils adjacent to the old remnant resacas of the Rio Grande. The densest vegetation is on levee soils (Type LAA) on either side of the old resaca on the northern side of the property. It extends along both sides of the drainage canal that forms the north boundary of Palo Alto Battlefield NHS (Figure 3), and along and within the old resaca. The levee soil continues along the southern side of the resaca, but the brush has been cleared for crop production. Levee brush is by far the most diverse and dense, although it suffers from grazing. Most of the remaining, non-levee brush on the battlefield is dominated by mesquite.

Tamaulipan Brushland overstory consists of Mesquite (*Prosopis glandulosa*), Granjeno (*Celtis pallida*), and Texas Ebony (*Pithecellobium flexicaule*). Lotebush (*Zizyphus obtusifolia*), snake eyes (*Phaulothamnus spinescens*), colima (*Zanthoxylum fagara*), brazil (*Condalia Hookeri*), prickly pear (*Opuntia lindheimeri*), and the native grass *Sporobolus Wrighti* dominate in the understory. Grazing has removed most other grasses from this area.

Less dense brushland, consisting largely of a Mesquite overstory and Granjeno, Colima, lotebush, *Yucca treculeana* and prickly pear understory, covers nonplowed transitional soils adjacent to the old resaca bed on the western side of the battlefield (Area C, Figure 3). This particular area of brushland is affected by grazing. *Borrichia* also grows in patches here, indicating the more saline nature of these soils. At the southwest corner and along the southern side of the battlefield, the densest brush occurs on small rises of a transitional soil type (LC). The vegetation makeup is the same, but supporting an occasional Texas ebony.

In the northern section of the battlefield, the transitional soil types (LC and CH) support a transitional vegetation structure, mesquite grassland. These soil types result in a gradation of dense brush close to the junction with soil type LAA, to sparse mesquite over *Spartina spartinae*. Often, there is less vegetation cover on the best LAA soils.

In general, the brushland is evergreen. Of the 38 or so brushland species, 5 are succulents and deciduous. Twenty-five of the remaining 33 species are semideciduous, depending on the severity of any particular drought. Some areas of brushland has been cleared for crop production. Type LAA soil often has been fertilized to improve either pasture or croplands in Cameron County, and the battlefield is no exception. Tamaulipan Brushland on the battlefield probably has changed little since 1846. However, cattle grazing has created some disturbed areas that allow invasion of herbaceous plants into this zone, and clearing of brush in some places has reduced its former extent.

Salt Prairie

This zone covers approximately 77 percent of the battlefield surface area. It is comprised of sub-prairie zones of: 1) almost pure stands of cordgrass (*Spartina spartinae*), termed Sacatal prairie; 2) a mixed transition zone of *Spartina spartinae* and *Borrichia frutescens* (Figure 7); and 3) pure stands of *Borrichia* and succulents, termed Borrichia prairie. Areas of the battlefield having a sparse Mesquite overstory and *Spartina* understory are also considered salt prairie (Scifres et al. 1980:397-410). Salt prairie is significantly lower in elevation than Tamaulipan Brushland.

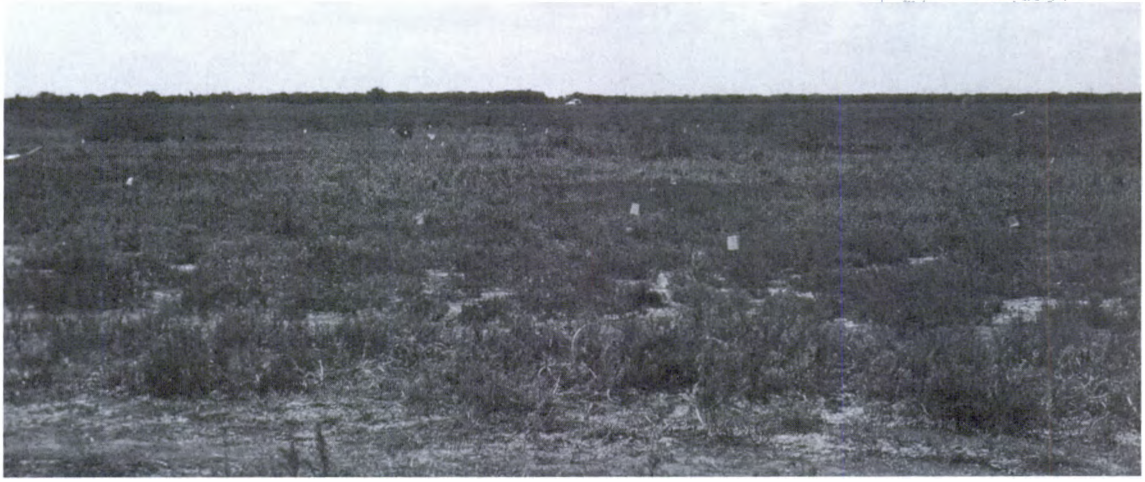


Figure 7. Mixed Salt-Borrichia Prairies, in vicinity of Mexican battle line; Brushland-covered clay dune ("Arista Hill") on horizon. Pin flags mark artifact locations. Looking southeast.

Cordgrass (*Spartina)* is by far the dominant grass in the Sacatal sub-prairie habitat. This grass grows to a height of 1-4 ft and provides cover for prairie species. *Spartina* can deal misery with its stiff, extremely sharp spine-tipped leaves and, as was demonstrated on the day of the battle, has the peculiar ability to burn readily while still green (Gould 1978:217) (Figure 8). Scattered mesquites and yuccas are locally common in places. Borrichia prairie generally defines slightly lower elevations, where salinity is liable to be higher, than lands containing salt intolerant *Spartina*. Thus, very little *Spartina* grows in the bottom of the old resacas even when pure stands of *Spartina* lie adjacent to the channel and only a foot higher in elevation.

The old resacas (soil type LM) generally qualify as ribbons of salt prairie because they are often dominated by *Borrichia*. Their generally lower elevation and wetter conditions, however, promote the sparse but regular existence of retama (*Parkinsonia aculeata*) and huisache (*Acaxcia smallii*) along the banks. Both plant species can withstand periods of standing water for months at a time. There is evidence land clearing has greatly increased the process of filling in the resacas. Cattle ranching and row crops caused other damage to the natural landscape and, in some places, this human impact has erased evidence of the original vegetation type.

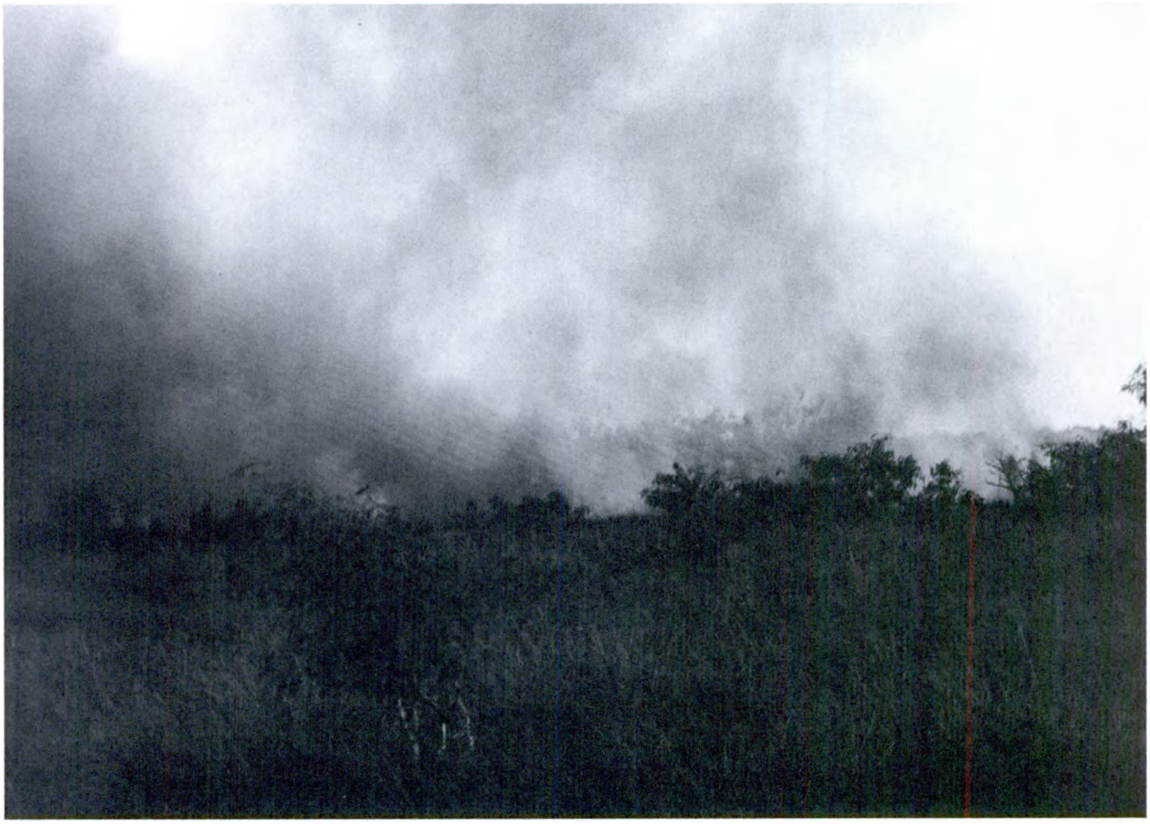


Figure 8. Burning off of mixed Cordgrass-Mesquite, encouraging new growth for grazing.

As is usually the case for the area, the salt prairie has escaped regular plowing. A section of prairie in the middle of the site shows apparent effects of past row plowing in a series of evenly spaced bands. These bands are the result of field trials for non-native grasses that are palatable to cattle. Large areas of salt prairie, particularly in heavy *Spartina* areas, show signs of past burning. Such burns are common in the area to remove the old *Spartina* growth promoting new green shoots for grazing (Figure 8). It is likely salt prairie within the battlefield has changed relatively little since 1846. However, salt prairie may have spread into old, filled-in resaca beds, as well as into areas disturbed by ranching and farming.

Wildlife

Diversity of habitat types in the LRGV results in a diverse vertebrate fauna. About 700 vertebrate species are within the region, and approximately 500 of these are present year round (Bray and Irwin 1991). Of these species, 67 are considered endangered or threatened by the U.S. Department of Interior or the State of Texas. The two ecosystems included on the battlefield, that is, brushlands and salt prairie, are often listed in the habitat types for many of these species (Tewes and Everett 1982). Both habitat types provide food, nest sites and cover for wildlife species. Many neotropical species reach their northern limits in the LRGV, including two endangered cat species

(Tewes and Everett 1982) and 21 bird species (Rappole and Klicka 1991; Chaney 1981). Invertebrate species receive little research. However, the same habitat alterations affecting vertebrate fauna must surely be detrimental to these species. The three habitat types of the battlefield site and surrounding area and their wildlife affinities are listed as follows:

Tamaulipan Brushland

The Tamaulipan Brushlands of the battlefield site suffer from both direct clearing for agriculture and grazing pressure. The highest wildlife diversity and abundances occurs in the brushlands of the site. Dense brush is of particular concern due to the endangered status of two native cats, the ocelot and jaguarundi. However, many other species also depend on such habitat for at least part of their life cycle.

Salt Prairie

This habitat has come under increasing concern as more research is done on wildlife species occurring there. Salt prairie contains a mixture of wetlands and grassy native flats supporting both seasonal and year-round species. For instance, the endangered Aplomado falcon nests in the brushy areas but forages largely in the open prairie.

Wetlands

The seasonal nature of the wetlands of the battlefield site in combination with their shallowness could be valuable to several species. Wading birds are fundamentally limited to a certain water depth when foraging. Large numbers of such species were observed feeding in flooded resaca beds both on the battlefield and on surrounding lands (Farmer 1992:15). Several species of amphibians unique to the LRGV are adapted to survive in such wetlands during dry periods.

CHAPTER THREE

HISTORICAL OVERVIEW

Under the administration of President James K. Polk (1845-49), the U.S. sought to persuade Mexico to sell lands for U.S. westward expansion. Persuasion included steady diplomatic, economic and military pressure. The strategy of "graduated pressure" was conceived in an atmosphere ignorant of the realities of Mexican domestic politics. Since the loss of Texas north of the Nueces River, no Mexican government dared discuss the voluntary surrender of additional land to the U.S. for fear of being overthrown. In fact, a substantial number of Mexican citizens favored war with the United States to recapture Texas. Polk's diplomatic onslaughts convinced various Mexican leaders their aggressive northern neighbor was attempting to annex their country. Such suspicions regarding the motives of the U.S. effectively stifled Mexican efforts to steer the dispute toward a peaceful resolution.

Taylor's Army of Occupation: Corpus Christi

Polk's aggressive diplomacy included military threat. On May 29, 1845, Polk ordered Brevet Brigadier General Zachary Taylor to move 1,500 regular troops from Fort Jesup, Louisiana, to a point near the Rio Grande. Taylor chose Corpus Christi, Texas, for his base, located at the mouth of the Nueces River. By the end of July he and his troops were encamped there. During the succeeding months, the camp increased in size to approximately 4,300 men, slightly over half of the entire regular U.S. land forces. Taylor's force contained the elements of four infantry and one dragoon regiment plus a regiment-sized battalion of "red-legged infantry", artillerymen serving as infantry. The infantry and dragoon units arrived fresh from service on the Indian frontier, while the artillerymen came from coastal defenses (Bauer 1986:57).

Organization of infantry regiments was in 10, 42-man companies. Each regiment contained one company formed as a grenadier unit, although hand grenades no longer were used by the U.S. army. A second company was trained and equipped as light infantry that functioned as skirmishers and sharpshooters. Light infantry companies often were combined to form a special battalion.

U.S. infantry excelled at individual and company drills, but the normal practice of stationing troops in small, two- to five-company detachments offered little opportunity for battalion drill. Taylor instituted a battalion training program at Corpus Christi in autumn 1845, but its effectiveness was questionable. Although Taylor initially instituted a strenuous training program, the effort slackened as the harsh fall and winter weather attacked the troops in their poorly protected encampment (Henry 1973 [1847]:14-52). However, despite a growing sick list and the presence of increasing numbers of grog shops, prostitutes and gambling dens, the army maintained its underlying discipline (Bauer 1986:60).

The horse regiments were dragoons rather than true cavalry; the mounted men were armed and trained to fight primarily on foot. Dragoon regiments consisted of 10 companies of 54 men each, normally deployed for frontier police duties stressing rapid movement by heavily armed men. Dragoons were too few in number to play a major role in the coming battles of the Mexican-American War. The artillery regiments were trained to serve both as gunners for the coastal defense batteries and as temporary infantry for supporting local militia. Their versatility allowed the artillery companies to function as the army's strategic reserve. One company in each of the four artillery regiments was armed as a light or field battery of four cannon, usually consisting of two 6-pounder guns and two 12-pounder howitzers (Bauer 1986:60).

In 1846 the U.S. Army contained no truly specialized troops. Fatigue parties drawn from line units and supervised by engineer officers did engineering work. The engineer officers were normally among the most promising graduates of West Point Military Academy, which in the 1840s was still the nation's largest single source of trained engineers. In May 1846, Congress authorized the formation of the Company of Sappers, Miners and Pontoniers, which would not see action until spring 1847.

Logistic support of the army in the field was the responsibility of the quartermaster, commissary, forage and ordnance departments. Each relied on hired civilians to man its wagons and depots under the control of officers belonging to the departments. Similarly, the medical department consisted of medical officers but no enlisted men. Nurses and others who helped staff the hospitals were either civilians or soldiers detailed to that duty. The regimental band also assisted in the removal of the dead and wounded (Huston 1966:129-131; Katcher 1976:9).

Prelude to War

In November 1845, President Polk received intelligence from the American consul in Mexico City that Mexico was willing to receive a diplomatic emissary "to settle the present dispute in a peaceful, reasonable, and honorable manner". Accordingly, he named Senator James Slidell of Louisiana as the new American minister to Mexico. Polk instructed the emissary to gain leverage for a boundary settlement by emphasizing unpaid American claims against Mexico, estimated to amount to more than $5 million. Polk hoped a nearly bankrupt Mexico would settle for money, offering a sliding scale of payments for various Mexican territorial cessions. Polk included determination of the Rio Grande as the boundary for Texas, which he insisted Santa Anna had acknowledged in 1836 and which the administration had already guaranteed to the Texans. For this minimum settlement Polk was willing to have the U.S. government accept the claims of its citizens against Mexico. The United States was willing to add an additional $5 million if Mexico would cede New Mexico (Graebner 1959:117-121). Polk also offered greater amounts for more land, including a top price of $25 million and assumption of claims for the cession of upper California (now the state of California), New Mexico and the Rio Grande boundary for Texas (Pletcher 1973:289).

In early December, Slidell arrived in Mexico City to negotiate. His mission, however, soon foundered in diplomatic technicalities. Herrera secretly agreed to negotiate with a U.S. *comisionado* (commissioner), but Polk apparently received a poor translation of Mexico's terms and mistakenly appointed Slidell as minister plenipotentiary, a high ranking diplomat. For Mexico to accept a minister would have implied restoration of full diplomatic relations and allowed Herrera's political opponents to charge he accepted the annexation of Texas. Mexico could not afford to grant such concessions before the negotiations even began and, therefore, on December 16, the Secretary of Foreign Relations, Manuel de la Peña y Peña, informed Slidell his credentials would have to be changed to commissioner before talks could begin (Bauer 1974:22-26).

Despite this snub of Slidell, Herrera was overthrown in January, 1846 by certain factions accusing him of weakness in dealing with the U.S. Major-General Mariano Paredes y Arrillaga, Commander of the Army of the North, assumed the presidency. Paredes adopted a hard-line over the issue of the Mexico-United States dispute by vowing to uphold Mexican sovereignty all the way to the Sabine River.

Word of Slidell's failure reached Washington in January 1846. Polk's reaction was to increase pressure on Mexico by ordering Taylor to move his troops to the Rio Grande. Taylor departed Corpus Christi on March 8. The heavy artillery, supplies and the sick traveled by water under naval escort to the village of Frontón de Santa Isabela on Point Isabel, on the coast just north of the mouth of the Rio Grande. The troops marching overland traversed a desolate, semiarid land. As the leading elements of the U.S. army approached the Arroyo Colorado, about 30 miles from Matamoros, they encountered Mexican troops who threatened resistance. Taylor brought up his trailing brigades and prepared to make an assault crossing. His light companies and dragoons dashed across the stream on the morning of March 20, while the artillerymen stood by their loaded batteries; however, the Mexican patrol offered no resistance and retreated into the brush.

On March 24 the Americans reached the junction of the roads from Point Isabel and Matamoros, located within the area known as "Palo Alto", and bivoucked opposite Palo Alto pond. Their encampment was later termed "Worth's Camp", after Colonel William Worth (Scarritt 1846:1); Taylor had left Worth in charge of the infantry while he proceeded to the coast with the dragoons. Just before the dragoons and Taylor arrived, the Mexicans set fire to the village of Frontón de Santa Isabela. About two hours before Taylor appeared, the transports and their excort arrived from Corpus Christi. Taylor garrisoned the base with two artillery companies under Major Munroe and ordered work started on a fort (later named "Fort Polk") to protect the supplies (Henry 1847:61-62).

Taylor and the dragoons rejoined the main body at Palo Alto, some 10 miles from the Rio Grande, on March 27. Upon arrival at the Rio Grande, the Americans began construction of a star-shaped, earthen walled fortress christened "Fort Texas". (Remnants of this fort can still be seen at the present-day Brownsville Municipal Golf Course). The Mexican commander at Matamoros, General Francisco Mejía, made no attempt to dislodge Taylor. Instead, he improved the artillery positions and earthworks of Fort Guerrero, located adjacent to Matamoros and across from Fort Texas. During this initial period of relatively peaceful confrontation, the Mexicans made strenuous efforts to induce U.S. soldiers to desert to their cause. At one time, the Mexicans believed the U.S. army's entire Seventh Infantry, a largely Irish and German unit, would desert en masse (Miller 1989:47). The actual number of deserters crossing into Mexico, however, was well under 100 men (Taylor 1846:302-303). On April 4, Mexico's Minister of War and Marine José Mariá Tornel y Mendevil ordered veteran officer Major-General Mariano Arista to command the Army of the North. Arista also received secret orders to attack Taylor's force on the Rio Grande (Bauer 1974:40-42).

During April, U.S. troops in Fort Texas experienced both hard work and boredom in the semitropical heat, their monotonous existence broken only on occasion by skirmishes with local guerrillas. On April 10, Chief Quartermaster Colonel Trueman Cross and Lieutenant Theodoric Porter were killed not far from Fort Texas. Mounted patrols were sent to apprehend or kill the guerrillas; one of these patrols was ambushed and a lieutenant killed (Meade 1913:52-53).

On April 11, Major-General Pedro de Ampudia arrived in Matamoros to supervise Mexican military operations. Shortly afterward Brigadier General Anastasio Torrejón followed with 2,200 troops. Ampudia immediately ordered Taylor to withdraw from his position on the river. Taylor both refused this demand and ordered a naval blockade of the mouth of the Rio Grande, thereby cutting Ampudia's maritime supply route. Ampudia took no overt action since he knew General Arista was about to replace him (Wilcox 1892:42-43).

On April 23, in Mexico City, President Paredes issued a manifesto in which he declared a state of war existed between Mexico and the United States. On the day following Paredes' declaration of war, General Arista arrived in Matamoros, assuming command of all Mexican forces in the north. Arista immediately held a council of war with his generals to detail an offense strategy. Later that day, April 24, Arista reviewed his assembled forces. General Mejía commanded the First and Tenth Line Infantries, the Second Light Infantry, the Seventh Cavalry, an elite battalion of *zapadores* (sappers), one squadron of auxiliary troops from different villas of the north, various presidial companies, and a battalion of the local national guard. General Ampudia commanded the Regiment of Light Infantry of Mexico; General Torrejón commanded the Fourth Infantry, the Eighth Cavalry and 80 cannoneers with six artillery pieces; and General Antonio Canales was commander of a mounted auxiliary regiment of irregulars. All of these troops totaled 5,200 men and 26 pieces of artillery (Sanchez 1985:10).

Arista also informed General Taylor hostilities between the two countries had commenced and launched his attack the next day (Bauer 1974:46-48). His plan called for Torrejón, with about 1,600 sappers, cavalry and light infantry, to cross the river at La Palangaña west of Matamoros. From there, they would strike east to sever the U.S. supply line to Point Isabel. Arista, with the main portion of the army, would cross at a point east of Matamoros and join with Torrejón's force (Roa Bárcena 1947:62; In Sanchez 1985:12), threatening the continued existence of Fort Texas.

Upon learning of Torrejón's crossing, Taylor sent out dragoon patrols to determine the location of these Mexican forces. On April 25, Torrejon ambushed a patrol led by Captain Seth Thornton at Rancho de Carricitos, 20 miles upriver from Fort Texas (Figure 9). The ensuing fight destroyed Thornton's command with 11 killed, 6 wounded and 46 captured, the latter including Thornton. News of the debacle reached Taylor on the 26th. Taylor sent a dispatch describing the clash to Washington, stating that "hostilities may now be considered as commenced" (Taylor 1846:96-97). The dispatch arrived on May 9; on May 11, the House of Representatives passed a bill declaring that a state of war existed between Mexico and the United States. The Senate voted in favor of the bill on the following day, and President Polk signed it on May 13 (Bauer 1974:48).

Meanwhile, Torrejón's force moved toward the Point Isabel-Matamoros road after destroying Thornton's command. On April 28, a Mexican patrol surprised a party of Captain Samuel Walker's Texas Rangers at their encampment. Five Texans died, the others captured or disbursed. The Mexicans succeeded in accomplishing the first phase of their mission, cutting the Fort Texas-Point Isabel supply route.

Word of Torrejón's close proximity caused a near panic at Point Isabel. Major John Munroe, commandant of this supply depot, quickly improvised a 500-man force of artillerymen, Texas volunteers and sailors from ships in the harbor to defend the base (Jenkins 1851:48-49). Torrejón, however, did not advance on the port; neither did he remain at Palo Alto and wait for Arista's reinforcements as initially planned. Mexican strategy changed due to a rumor that U.S. snipers were in place to assassinate Arista while he and his forces crossed the Rio Grande. A suddenly worried Arista ordered Torrejón to abandon his position at Palo Alto and protect this troop crossing. Under these orders Torrejón and his command broke camp and headed south to Rancho de Longoreño, a Rio Grande crossing 13 miles downriver from Matamoros (Roa Bárcena 1947:62; In Sanchez 1985:12). The Point Isabel-Matamoros Road was open again, if only for a few days.

Captain Walker, the company leader of Texas Rangers whose men had been so ignominiously surprised, delivered Munroe's appeal for assistance to Taylor on April 29. The general belatedly realized the importance of securing both installations. He put every man "not detained by other indispensable duty" to work completing the walls of Fort Texas so it could withstand a siege. Once accomplished, U.S. forces could march to the aid of Munroe and reopen the supply line (Jenkins 1851:99). Taylor's quickened efforts came none too soon. Ampudia led the first brigade of Mexican infantry across the river at Longoreño on April 30; Arista followed the next day with a second brigade. General Mejía remained behind with 1,400 men to protect Matamoros (Smith 1919:162-163).

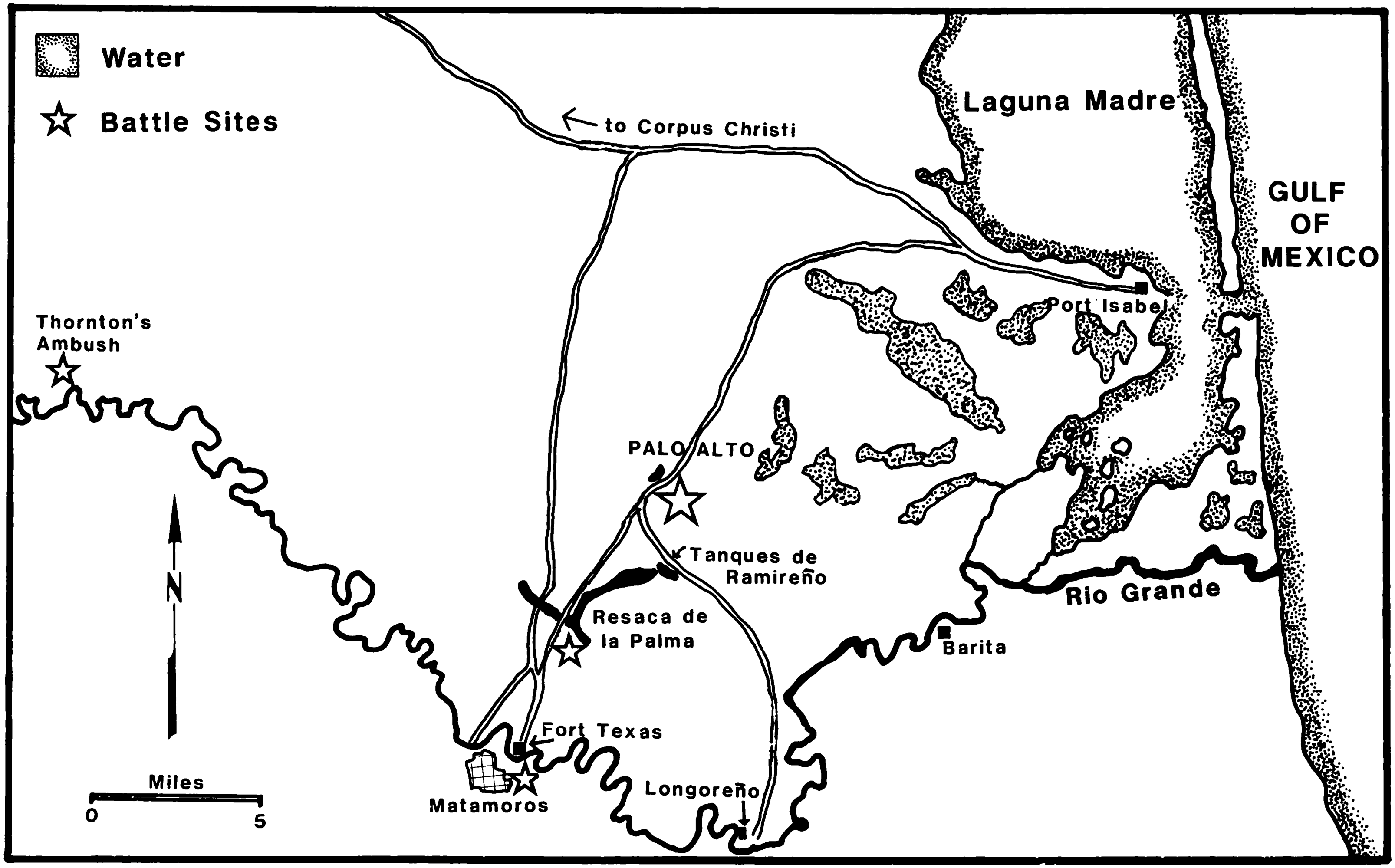

Water
Battle Sites
to Corpus Christi
Laguna Madre
GULF OF MEXICO
Port Isabel
Thornton's Ambush
PALO ALTO
Tanques de Ramireño
Resaca de la Palma
Rio Grande
Barita
N
Miles
0
5
Fort Texas
Matamoros
Longoreño

Figure 9. Map showing the vicinity around Palo Alto at time of battle.

Taylor learned of the crossing on the afternoon of May 1, too late to attempt an attack of the Mexican bridgehead. The American general logically assumed Arista's objective was Point Isabel. Taylor lost no time in starting for his supply base. Within two hours a relief force of about 2,300 men, led by Taylor, left for Fort Texas. The Mexicans watching from across the river rejoiced, for they assumed the departure signaled an American retreat (*Niles National Register* June 13, 1846:223). They were wrong. Major Jacob Brown remained at the incomplete fort with some 500 men of the Seventh Infantry, supported by two batteries of 18-pounders and a 6-pounder field battery. Brown's orders were to hold Fort Texas until Taylor's force returned with supplies sufficient to withstand a lengthy siege. Taylor's force marched until midnight, encamped at Palo Alto, rose early on the 2nd and arrived around noon. They immediately began improving defenses and organizing a train of some 270 supply wagons (Taylor 1846:289-190).

Once Arista completed ferrying his men across the Rio Grande on May 2, he divided his command: Ampudia led the Fourth Infantry, the Puebla Battalion, some sappers, and about 200 light cavalry toward Fort Texas; Arista's force of 3,500 men proceeded to Palo Alto, reaching that crossroads on May 3 (Roa Bárcena 1947:64; In Sanchez 1985:13). The Mexican army was one day too late to stop the Americans from reaching Point Isabel; however, it could still block their return to Fort Texas.

The Mexicans soon discovered the water supply at Palo Alto was inadequate for their needs, and it was possible Taylor could take a short cut to Fort Texas by marching south of Palo Alto. Accordingly, Arista pulled out to Tanques de Ramireño, about three miles to the south on the Matamoros Road. This location had an abundance of good water, and from there he could watch the junction of trails to the Fort Texas-Matamoros area. Arista and his army arrived at Tanques de Ramireño on May 5 (Roa Bárcena 1947:64).

The Mexican siege of Fort Texas began early in the morning of May 3, in conjunction with the batteries at Matamoros (Roa Bárcena 1947:63; In Sanchez 1985:13). The rumble of artillery could be heard by those at Point Isabel, including a now-anxious General Taylor. Taylor sent several Texas Rangers to Fort Texas with orders for Major Brown to hold out at all costs. The Rangers made their way to the besieged fort, returning the next day with Major Brown's confident response. By May 7, Fort Polk was fortified and supply wagons ready to return to Fort Texas (*Niles National Register* June 20, 1846:254).

The Mexican siege consisted of an almost continuous artillery barrage from positions in Matamoros. The U.S. fort rationed its counter fire due to limited gunpowder; nevertheless, it was sufficient to discourage a major assault. Damage to the earthen walls of Fort Texas was minimal, while its defenders remained relatively protected inside bunkers; however, a U.S. sergeant died on the first day of the siege, and Major Brown was severely wounded on the morning of May 6. That afternoon the Mexicans made a formal request that the fort surrender, but acting commander Captain E.S. Hawkins rejected it. Major Brown died the afternoon of May 9, shortly before Taylor relieved the fort (Taylor 1846:292-294).

Taylor delayed his return to Fort Texas until sufficient volunteer reinforcements arrived on May 6, thus ensuring the safety of Point Isabel. The following morning he alerted the troops to be prepared to march that afternoon. "The Commanding General has every confidence," he told his men, "in his officers and men. If his orders and instructions are carried out, he has no doubt of the result, let the enemy meet him in what numbers he may. He wishes to enjoin upon the battalions of infantry that their main dependence must be in the bayonet" (Taylor 1846:294-295).

Taylor burdened his column with some 270 wagons loaded with supplies, hindering rapid movement and possibly endangering the supplies in an engagement. He further limited his mobility by adding to the force a pair of 18-pounder siege cannon, each drawn by six yokes of oxen. Because of the late start and slow pace, the American force of 2,228 men bivouacked after marching only seven miles. They continued the march before the sunrise of May 8, with the commander riding in "a jersey wagon of ponderous materials and questionable shape" (Hamilton 1941:177-181).

Mexican scouts observed signs of the route Taylor chose and reported back to Arista during the early morning of May 8. The Mexican general, concerned the report might be misleading, sent out another patrol to reconnoiter. A scouting party of Texas Rangers ambushed this patrol just east of Palo Alto; most of the Mexicans escaped, returning to Tanques de Ramireño with solid evidence of the slowly advancing U.S. army. Arista immediately gave the order to break camp and march toward the enemy. He also sent orders for Ampudia to break off the siege and rejoin him at Palo Alto (Sanchez 1985:12).

Ampudia was on his way by noon, leading the Fourth Line Regiment of Infantry, a company of sappers, a pack train of 200 horses and two artillery pieces as well as Canales' mounted irregulars. Fearing Arista would do battle before his arrival, Ampudia set a fast-paced march to the place of rendezvous. While Ampudia marched, Arista positioned his battalions just south of Palo Alto pond and bisected the road with them (Sanchez 1985:13). By early afternoon Taylor's army cautiously entered the imminent battlefield, its location chosen by the Mexican general.

The Battle of Palo Alto

The plain of Palo Alto ("Tall Timber") took its name from the relatively tall stands of mesquite that began there and, interspersed with patches of open ground, stretched southward toward the Rio Grande. Then, as now, the roughly two mile diameter open plain was covered by stiff, shoulder-high and sharp-pointed grass that deals misery to anyone moving through it on foot. As soon demonstrated, this grass also has the peculiar ability to burn easily while still green. In addition to a semipermanent pond, Palo Alto included shallow depressions and old river meanders, termed *bolsons* and *resacas*, respectively, by the Mexicans. Due to recent heavy rains, these features on the day of battle held standing water or else were marshy. A belt of mesquite and scrub-covered low rises and resaca levees demarcated the northern, southern and eastern limits of the grassy plain. Bushes and tall mesquite both bordering and obscuring a resaca and its low, broad levee defined the western limits.

There were two roads connecting Matamoros with the Gulf on this side of the Rio Grande: El Camino de Santa Isabel and El Camino de los Indios. The former was usually travelled because it was six miles shorter. However, when it rained, this road was avoided due to the black clay mud that made it almost impassable. Because of the recent rains, Taylor's army had to take El Camino de los Indios, the so-called "wet weather road". To follow this drier road south through Palo Alto, the Americans first had to pass by a marshy area, El Tule Grande (present-day Tule Lake Bed) (Rayburn et al. 1966:40). The road then followed along the low levee demarcating the western limits of the prairie. By noon of May 8, however, the left flank of the Mexican army blocked this latter road segment.

The American army may have had its first view of the massed Mexican army at about the time they reached the southeastern end of El Tule Grande. Taylor then halted his column some two miles from the Mexican line to allow the wagon train to close. Then the Americans, still in column, moved forward again until they were about .75 miles from the enemy and adjacent to a body of standing water. Here they halted to water the horses and men. Arms were stacked and "every man was made to go to a pond, half of each regiment at a time, and fill his canteen" (Taylor 1846:177). This water source was Palo Alto pond and possibly the nearby resaca as well (Areas A and C, respectively, Figure 3).

Once refreshed, the troops formed in predetermined battle order to the right and left of the road. Taylor also used this time to move the wagon train into defensive position near the pond. One squadron of dragoons was stationed as wagon train guards (Bauer 1986:69). Taylor's plan was to mass troops on his right flank and rely on a bayonet charge. Whether this plan was based on a perceived relative weakness of the Mexican left, or the ground was better here for his infantry, or simply that the road ran there is unknown (Bauer 1974:53).

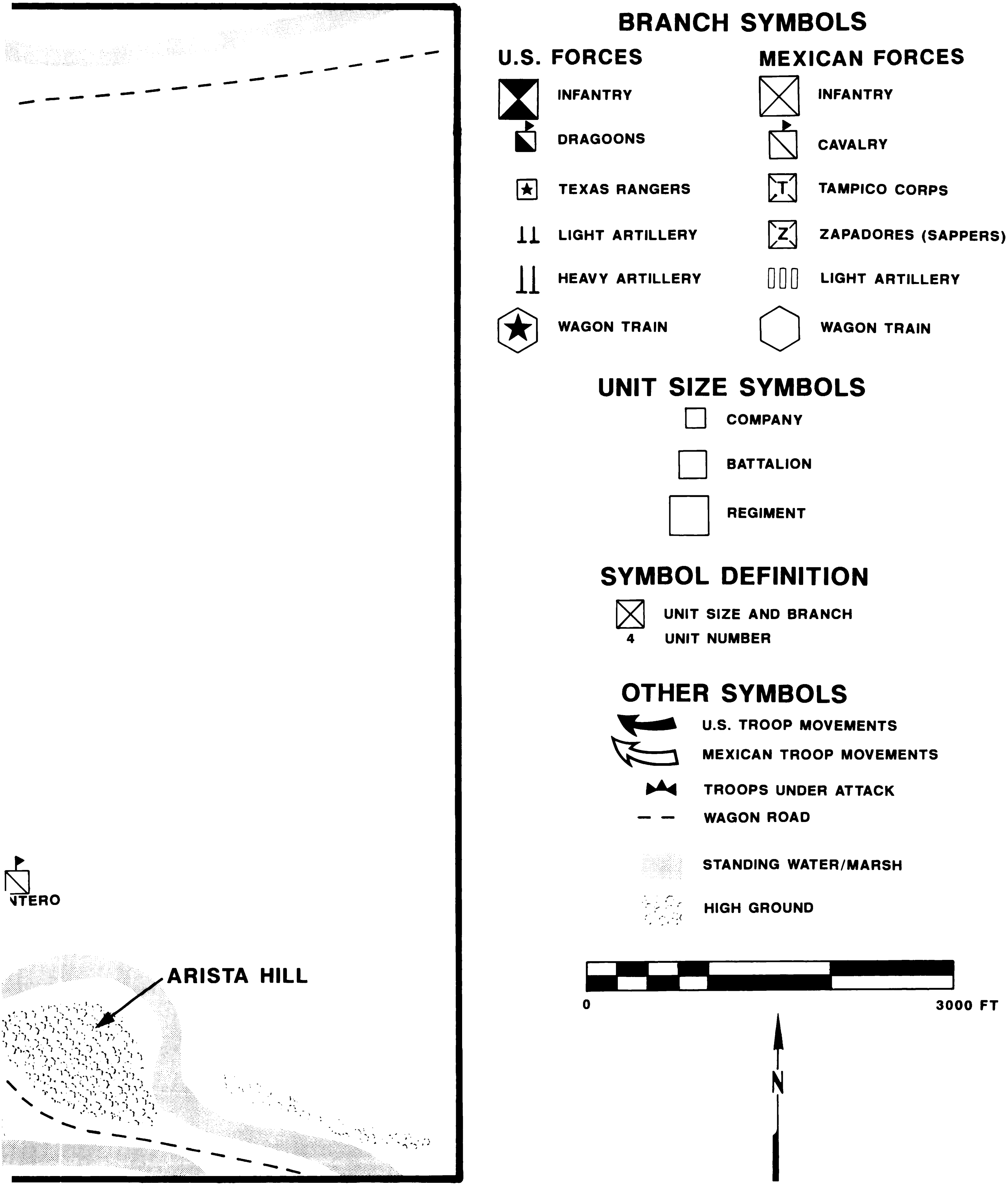
In keeping with his plan for a bayonet charge down the road, Taylor placed Brigadier General David Twiggs' right wing astride the road: Lieutenant Colonel James McIntosh's Fifth Infantry took the extreme right, followed by Brevet Major Samuel Ringgold's field battery (Figure 10); Captain Walker's mounted Texas Rangers, numbering 25 men, performed right flank picket duty west of the road and within the mesquite thicket; the two 18-pounders under Lieutenant William Churchill, supported by Captain Lewis Morris' Third Infantry, held the road; and the Fourth Infantry, under Major George Allen, was Twiggs' easternmost unit. He held in reserve Captain Charles May's dragoon squadron.

Brevet Lieutenant Colonel William Belknap's left wing deployed, from west to east, the "Foot" Artillery Battalion of Lieutenant Colonel Thomas Childs, Captain James Duncan's battery and the Eighth Infantry led by Captain William Montgomery. Captain Croghan Ker's dragoon squadron had the dual responsibility of guarding the train parked near the pond and supporting the U.S. left wing.

Once positioned, U.S. troops had about an hour to stare at Mexican bayonets and lance heads glinting in the sunlight and enemy pennons and flags rippling in the Gulf breeze. Brightly uniformed Mexican troops formed a line stretching over one mile long, double that of the American line. General Arista could be seen as he rode his horse down the front of the line and exhorted his soldiers; they responded with tossed banners, cheers and shouts of "*¡Viva la Republica!*", mingled with strains of martial music from regimental bands (Wilcox 1892:53). "As a response to this sight, the [American] regimental colors were then stripped of their coverings, and amidst deafening cheers unfurled in defiance, and thrown to the breeze" (Thorpe 1846:74).

Taylor's battle order apparently was conceived and executed prior to intelligence regarding exact placement of Mexican artillery. Belatedly, Taylor sent Captain May and his dragoons to reconnoiter the Mexican line and, if possible, draw artillery fire. But the Mexican cannon were hidden by the tall grass and ranks of infantry. The dragoons returned defeated by the tall grass (Brooks 1965 [1849]:127). Lieutenant Jacob Blake of the Topographical Engineers, with civilian aide-de-camp Lloyd Tilghman, then volunteered for the task. They galloped down the entire length of the Mexican line within its musket range. No effort was made to drive off this unwanted inspection. At one point the two men dismounted, noted in detail the position of one of the Mexican batteries, remounted and returned to report (Henry 1950:57). Their reconnaissance "resulted in the discovery of at least two batteries of artillery in the intervals of their cavalry and infantry" (Taylor 1846:2).

The resaca (Area C, Figure 3) anchored Arista's left flank. This flank also bisected the road that led to Matamoros at a point where the road skirted the mesquite forest. Located somewhere within this forest was General Canales with some 400 irregular cavalry . Canales' force was not involved in the ensuing battle; the reason for their inaction is not known. General Torrejón's cavalry brigade held the road. His men were arranged with the *presidiales* on the extreme left, followed, as one moved to the right, by the Eighth Cavalry, Seventh Cavalry, and the Light Cavalry.


NTERO
ARISTA HILL
BRANCH SYMBOLS
U.S. FORCES
INFANTRY
DRAGOONS
TEXAS RANGERS
LIGHT ARTILLERY
HEAVY ARTILLERY
WAGON TRAIN
MEXICAN FORCES
INFANTRY
CAVALRY
T
TAMPICO CORPS
Z
ZAPADORES (SAPPERS)
LIGHT ARTILLERY
WAGON TRAIN
UNIT SIZE SYMBOLS
COMPANY
BATTALION
REGIMENT
SYMBOL DEFINITION
UNIT SIZE AND BRANCH
4
UNIT NUMBER
OTHER SYMBOLS
U.S. TROOP MOVEMENTS
MEXICAN TROOP MOVEMENTS
TROOPS UNDER ATTACK
WAGON ROAD
STANDING WATER/MARSH
HIGH GROUND
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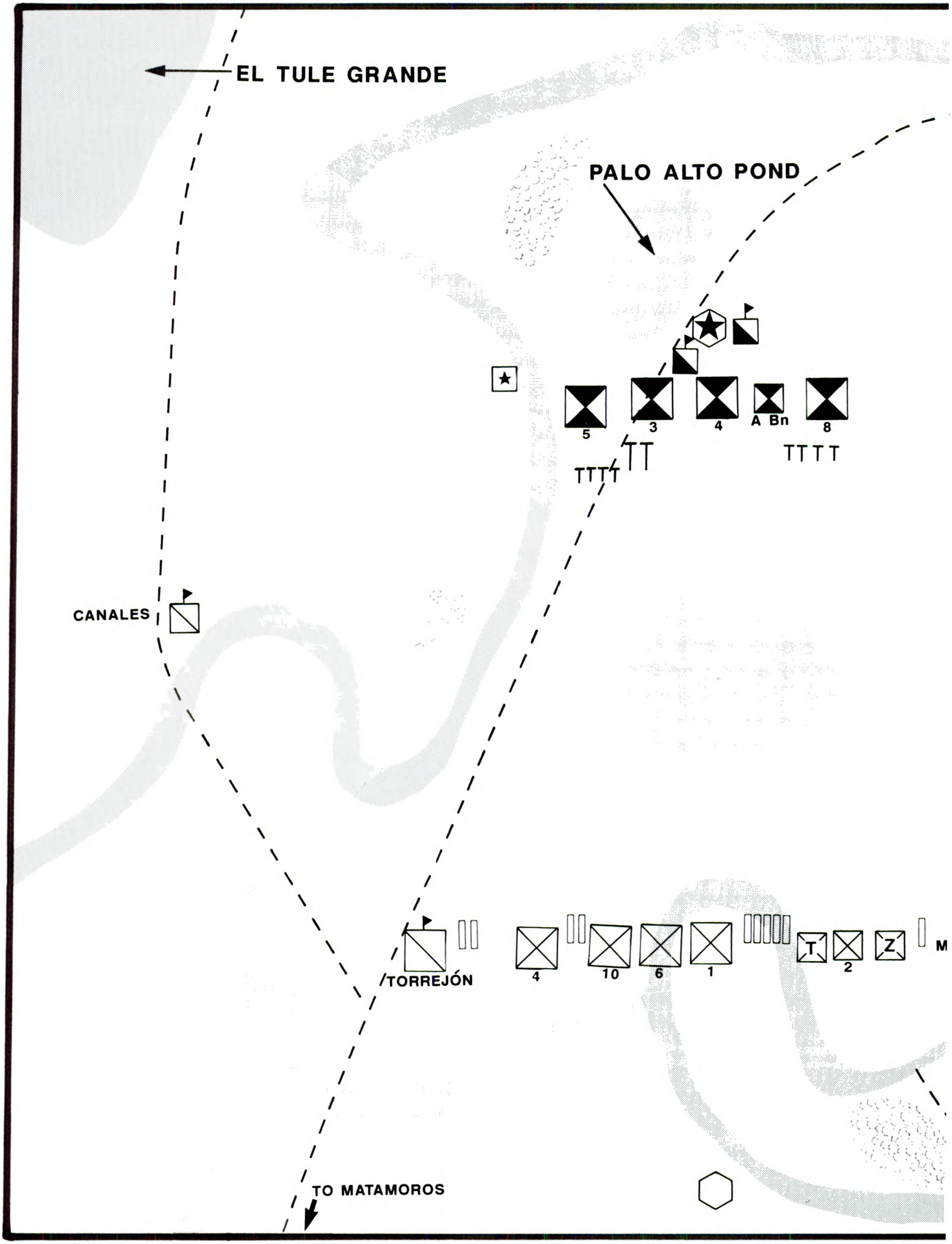
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Figure 10. Initial battle lines, approximately 1 p.m.

To the right of the Mexican cavalry stretched a long line of infantry interspersed with artillery batteries. General Ampudia arrived just in time for his Fourth Infantry to take its place on the left of this line. To its right was General de la Vega's brigade consisting of the Tenth and Sixth Infantry centered by two 8-pounders, then the First Infantry with five 4-pounders stationed on the right flank of the latter regiment. Completing the infantry line were the Tampico Coastal Guards, the Second Light Infantry, and a battalion of *zapadores* on whose extreme right stood a lone 4-pounder. The remaining light cavalry under Colonel Cayetano Montero waited between the infantry and two low rises or *motitas* (Area E, Figure 3) that also anchored the Mexican right flank, and around whose bases ran the road to Tanques de Ramireño (Area D, Figure 3). A protective screen of sharpshooters, termed *cazadores*, were thinly spaced in front of the Mexican line (Figure 11). Interestingly, Berlandier in his journal stated that Arista's army also included an unknown number of nomadic Indians as well (Berlandier 1847; journal entry dated March 23, 1847). The Mexican baggage train, hospital and camp followers were located several hundred yards to the rear of the Mexican center.

The actual total count of Mexican troops at Palo Alto is uncertain. One contemporary Mexican account set the number at 3,000 (Ramsey 1850:46; this source also said both armies were roughly the same size); and Arista later gave testimony at a Board of Inquiry that he had 3,461 enlisted men and 365 officers on his battle line (*Anon.* 1846b). Unclear, however, is if this number also included those troops not actually on the battle line, for example, Canales' irregulars. In contrast, contemporary U.S. sources consistently estimate a Mexican troop more than double or even more than triple Taylor's army of 2,228 men (e.g. Meade 1913:83; *Niles National Register* May 30, 1846:196).

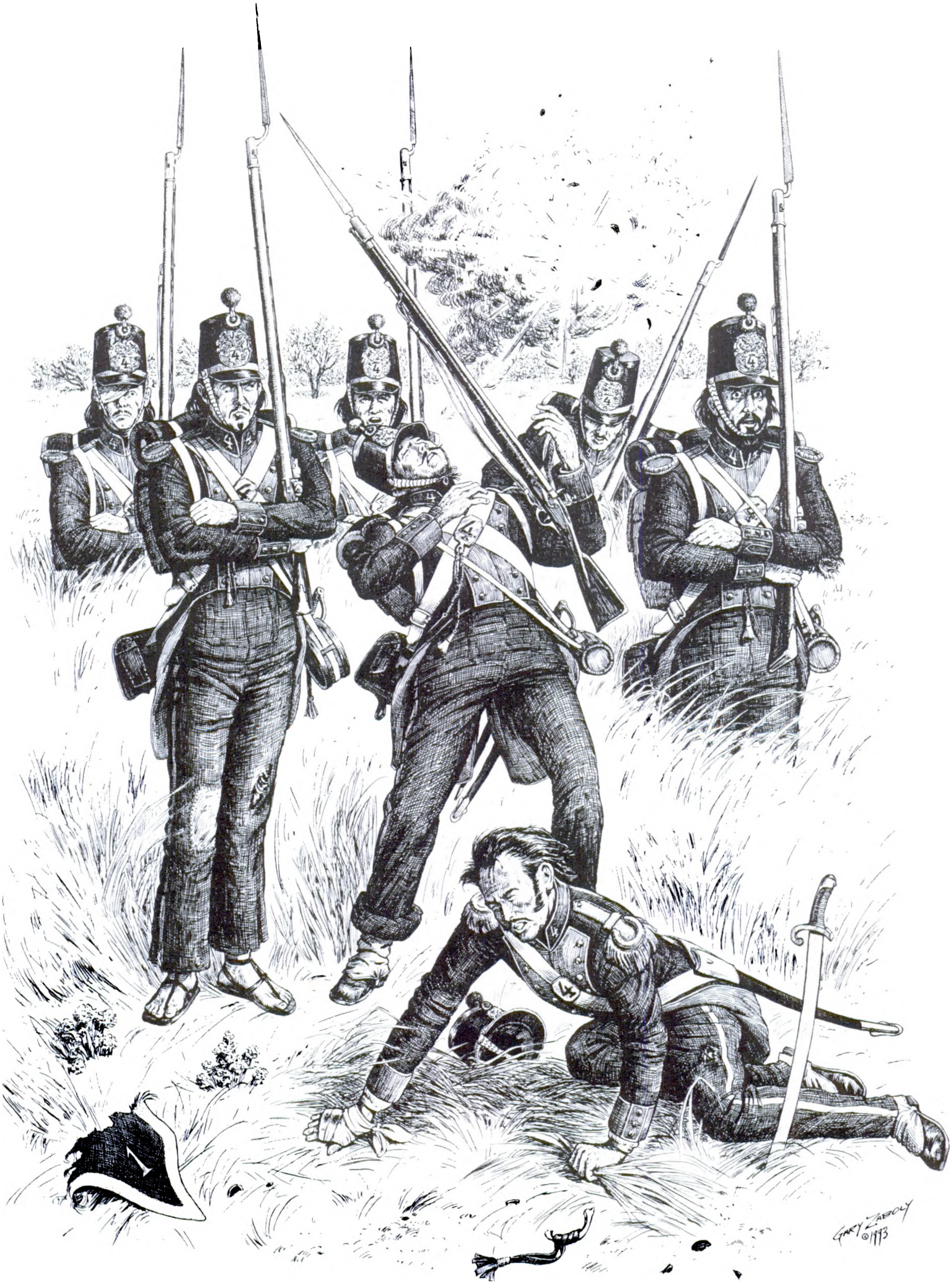
The Mexican formation was conceived as a trap for an infantry attack coming down the road or across the plain. In either case, Mexican cavalry could envelop any attackers. The weakness of the formation was the length of the two man deep Mexican line; it absorbed all available men, with no reserves to contain a breakthrough or counterattack. Also, because Mexican artillery was difficult to shift on the battlefield, Arista could not significantly rearrange his formation once set (Bauer 1986:69-70).

Taylor ordered his infantry to advance in columns. Around 2:30 p.m. Mexican artillery suddenly opened fire and one of their solid shot arched over the advancing Americans and landed on an artillery caisson in their immediate rear, killing its driver. Seeing this hit, the Mexican soldiers yelled "¡*Viva Mexico!*" (Roa Bárcena 1947:79; In Sanchez 1980:19). U.S. troops halted while the two field batteries wheeled into action. At the same time, the Eighth Infantry moved slightly back and to the left in square formation to secure the left flank. The other infantry units all moved from column into line formation.

Both Ringgold's and Duncan's light batteries moved forward about 100 yd in front of the American line and within 700 yd of the Mexican left flank. The two batteries opened fire with rapid, accurate and destructive precision. At the same time, the oxen-drawn 18-pounders, which had to stay on firm ground due to their ponderous weight, slowly swung into position on the road, under the personal supervision of General Taylor. They soon joined in and concentrated their fire on Torrejón's cavalry on the Mexican left flank (Taylor 1846:2; *New York Herald* May 28, 1846:2).

The Mexican Fourth Infantry Regiment had just arrived when the Mexican artillery commenced its fire. This regiment, still in column formation, had begun its advance onto the battlefield and taken its station next to the Tenth Regiment, already in line formation. To the Americans .5 miles away, it appeared the advance of the Fourth presaged a bayonet attack. All three U.S. batteries focused their fire on this particular regiment (Ramsey 1850:47). "Sometimes a single [U.S.] shot appeared to mow down a whole platoon of mounted men; and here, there, everywhere gaps opened in the [Mexican]

Figure 12 *(Overleaf)*. Mexican Fourth Line Regiment, under artillery attack. The illustration depicts infantrymen in "arms at high" position, after Orga (1808:128, Figure 3). A private's uniform in this regiment is believed to have consisted of dark blue pants and a waistcoat fronted by a red plastron with plain brass buttons. The white leather crossbelts are centered by a brass plate showing the cut-out number "4". Attached to the plate via a chain are the musket vent pricker and brush. The leather shako also has a brass plate with the number "4". Infantrymen carry either a keg-shaped, one-quart canteen as mentioned by Hefter et al. (1958), or a wooden round canteen obtained via U.S. stores prior to the war. The privates are armed with the British India Pattern "Brown Bess" musket. The wounded man on the ground is a First Sergeant, as noted by the fringed epaulettes on his shoulders. His damaged sword is an infantryman's *briquet*. In the lower left foreground is a fragment of a saddle cloth or *shabraque*, with a brass number "1" signifying the First line regiment. Illustration by Gary Zaboly.


GARY ZABOLY
©1993

infantry. With vivas the gaps instantly closed, but they would not stay closed" (Smith 1919:166) (Figure 12). U.S. artillery was, at times, inaccurate, since, according to one Mexican account, many enemy artillery rounds fell to the rear of the Mexican field hospital "which was obliged to change position" (Berlandier 1846:166; In Sanchez 1985:16).

At about this time it occurred to Taylor, or was pointed out to him, that a costly bayonet charge by the U.S. was not needed. The general, whose experience with artillery was nearly nonexistent, underestimated their impact in an open-field battle (Bauer 1986:69). One observer, then-Brevet Lieutenant Ulysses S. Grant, noted most of the U.S. infantry during the entire battle "stood at order arms as spectators, watching the effect of our shots upon the enemy, and watching his shots so as to step out of their way" as the Mexican solid shot ricocheted and rolled through the tall grass (Grant 1885:92). In several U.S. units, notably the Artillery Battalion and the Eighth Infantry, officers had their men sit on the ground to avoid the bouncing balls (McIntosh 1846; Bauer 1986:71). For the most part the Mexican artillerymen focused their fire on the U.S. batteries because they were closer and, just as critical, the sole cause of mounting Mexican casualties.

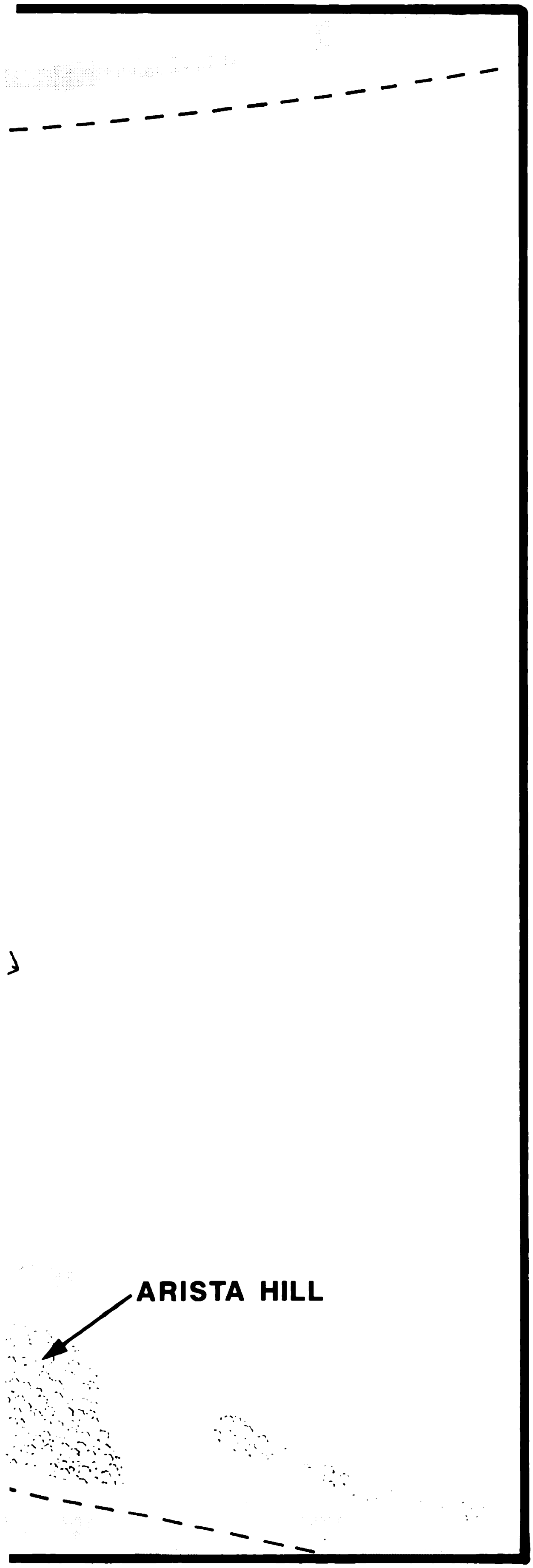
The years of hard training paid off for Ringgold's men, as rapidly deployed batteries and sections of batteries moved at will around the battlefield "as if they were on a parade ground" (Bauer 1974:55). With rapid-fire accuracy, the gunners demonstrated their ability to pick specific targets instead of simply taking blank aim at masses of men (Nichols 1963:76). For example, one Mexican regimental band began to play the martial tune *Los Zapadores de Jalisco* ("The Engineers of Jalisco"), to try to bolster the morale of the troops. U.S. gunners of one fieldpiece took aim at the musicians and, with one explosive shell, destroyed the entire band (Curtis 1846; Robertson 1985:58).

U.S. batteries sustained relatively minor damage during the entire battle. On occasion the two lumbering 18-pounders under Churchill's command were pulled forward down the road, then slowly repositioned with the aid of their respective oxen teams. These animals presented themselves as large, slow targets, yet most survived the battle unscathed. "It is understood that some of the oxen were converted into beef by the shot of the enemy during the action" (Churchill 1888:71).

The decimation of Mexican ranks induced Arista to abandon his plan to charge both U.S. flanks with infantry-supported cavalry. One historian speculated his first plan was the correct one, since Arista's men were still eager to fight and the U.S. batteries would not have done much more harm at closer range. Apparently, Arista believed it impractical for his men to wallow slowly forward through the sharp-pointed grass under such withering fire (Smith 1919:166). Something had to be done, however, since his troops grew impatient.

After about an hour of this punishment Arista ordered Torrejón, with some 1,000 lancers and two 4-pounders, to turn the U.S. right flank (Figure 13). Reluctantly, Torrejón obeyed. With sounding trumpets, they advanced through the grass, across a resaca and into the chaparral. The lancers' horses soon bogged down in another, deeper resaca that suddenly appeared in the low brush (Smith 1919:167). Torrejón's slow progress through the morass was observed and reported to Taylor, who took a moment from message writing to laconically reply "Keep a bright lookout for them", then returned to his task (Bauer 1986:70). Colonel David Twiggs, who was in charge of the threatened right flank, reacted with more assertion. He sent his right flank regiment, the Fifth Infantry, about 500 yds to its right and front and into the brushy chaparral. There it formed a square (Twiggs 1846:19).

Meanwhile, Torrejón's cavalry force regrouped once on firmer ground, then charged the U.S. Fifth en masse. The Mexicans in front included the unseasoned *presidiales*, many of whom discharged



BRANCH SYMBOLS

U.S. FORCES		MEXICAN FORCES	
⧗	INFANTRY	⊠	INFANTRY
◩	DRAGOONS	⧅	CAVALRY
★	TEXAS RANGERS	T	TAMPICO CORPS
⫫	LIGHT ARTILLERY	Z	ZAPADORES (SAPPERS)
⫫	HEAVY ARTILLERY	▯▯▯	LIGHT ARTILLERY
⬡★	WAGON TRAIN	⬡	WAGON TRAIN

UNIT SIZE SYMBOLS

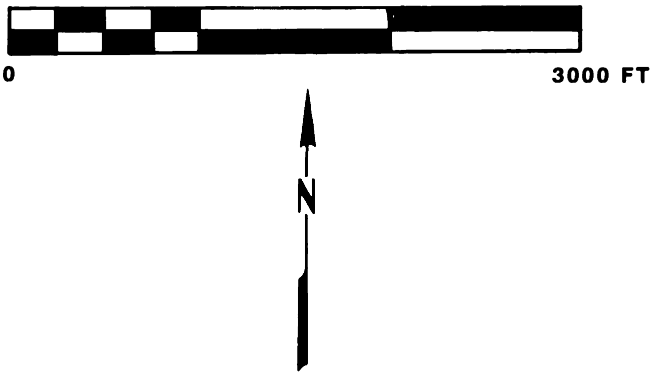
- ☐ COMPANY
- ☐ BATTALION
- ☐ REGIMENT

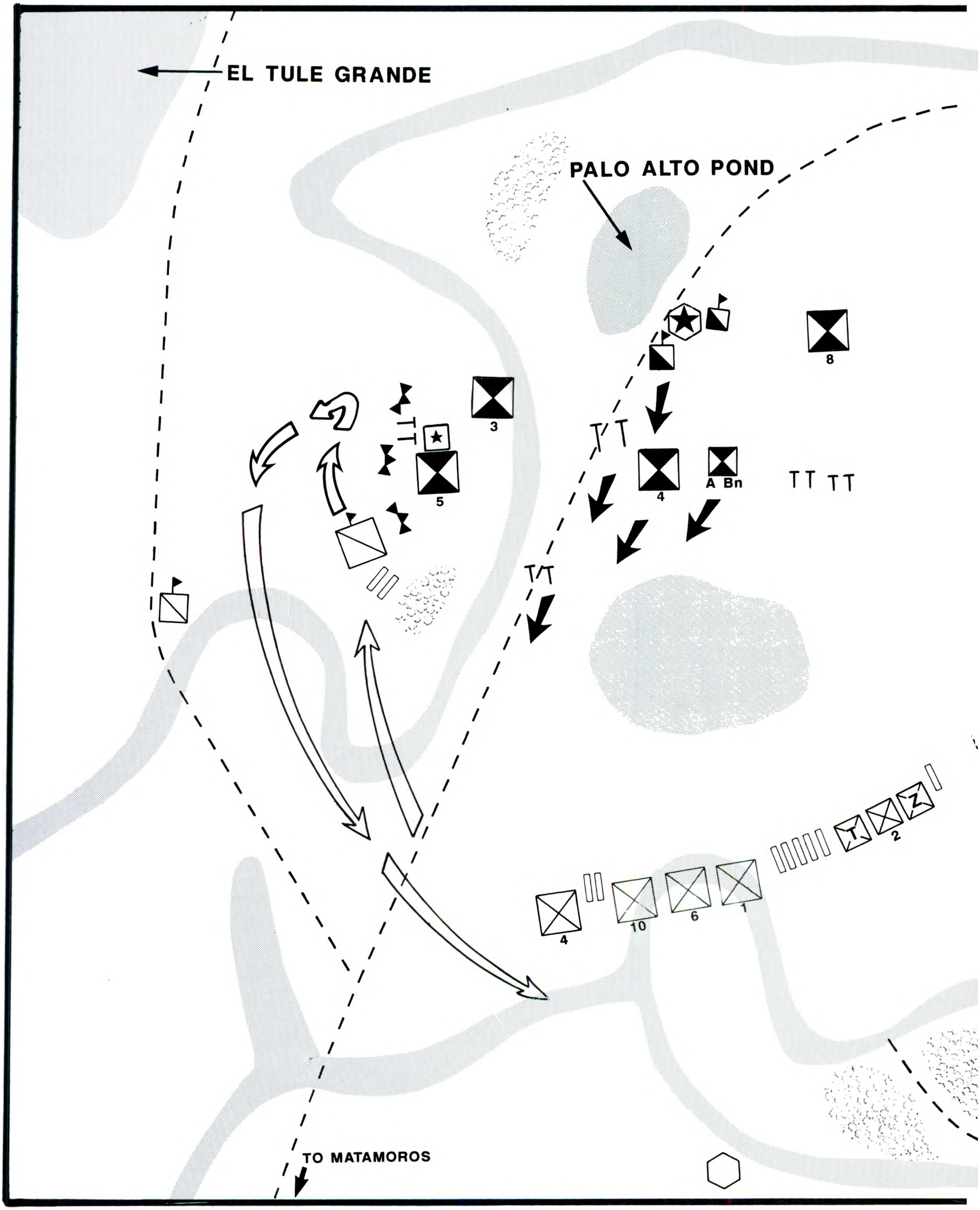
SYMBOL DEFINITION

⊠ UNIT SIZE AND BRANCH
1 UNIT NUMBER

OTHER SYMBOLS

- ← U.S. TROOP MOVEMENTS
- ⇦ MEXICAN TROOP MOVEMENTS
- ⧓ TROOPS UNDER ATTACK
- – – WAGON ROAD
- ░ STANDING WATER/MARSH
- ⁘ HIGH GROUND




EL TULE GRANDE
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6
1
TO MATAMOROS

Figure 13. Battle lines, approximately 2-4 p.m.

their *escopetas* at an ineffective range toward the enemy. The west face of the Fifth's square held their fire, then responded with a disruptive volley delivered at a range of about 50 yd. After two such charges and a loss of at least 10 men, the Mexicans retreated approximately 300 yd. American casualties in this attack was limited to a few wounded (Scarritt 1846:3). At about this time, the U.S. Third Infantry moved into a defensive square to the right and south of the train. Torrejón sent word to Arista that the resaca made such a maneuver impractical. Arista ordered Torrejón to try again. This time Torrejón's men maneuvered further north, then east, to avoid both the murderous fire from the Fifth and to get the baggage train. Instead, the Mexicans received a volley from another face of the Fifth's square, driving the Mexicans to retreat with considerable losses. Also, the defensive presence of the Third Infantry dissuaded any significant attack on the U.S. train.

At around this time, Torrejón's two 4-pounders finally crossed the swampy resaca and, with protection from retreating lancers, prepared to fire on the U.S. Fifth, located 400 yd away. But a section of Ringgold's battery, under the command of Lieutenants Randolph Ridley and Samuel French, arrived "at full speed" just in time to defend the infantry square. Walker's Rangers, assigned to protect the Fifth, leveled their rifles at the approaching enemy cavalry. U.S. guns opened fire with canister and spherical case shot "so promptly and with such effect that the enemy's artillery were completely routed and retreated precipitately [sic] under the protection of their cavalry without discharging a gun" (McIntosh 1846:3). "Walker's Rangers...gave them their rifle balls with their usual coolness and deadly aim" (Smith 1917:49). The Mexicans lost dozens of men with the remainder driven back to the Mexican line (Taylor 1846:2-3).

It was now around 4:00 p.m. The wind blowing in from the Gulf increased and smoldering cannon wadding discharged by Duncan's battery ignited the tall cordgrass. Smoke and flames quickly spread and obscured both armies, causing the cannon fire to slacken. Many Mexican wounded, lying on the field, tragically burned to death (Ramsey 1850:47). Taylor's men used the lull in the fighting to collect their dead and wounded, remove and repair gun carriages and caissons, replenish their ammunition and get water "for the men who were suffering greatly from thirst, as the prairie was in a blaze and the day intensely hot" (Peck 1970:23). Taylor also issued orders for a realignment. He had the 18-pounders moved down the road to a spot close to the original position of the Mexican left flank. The Fourth Infantry was to the left of these cannon; the Fifth Infantry moved forward and anchored the extreme right flank to prevent a repetition of Torrejón's earlier flanking attempt. The effect was to pivot the entire U.S. line counterclockwise (Taylor 1846:2-3).

Arista also used the time to realign his forces. He also pivoted in line counterclockwise, so his right flank advanced about 400 yd. His Fourth Infantry and lancers fell back to the south and east. The Mexican realignment left the wagon road open for a U.S. advance of the 18-pounder battery. As before the lull, several shallow pools of water lay between the two forces (Area F, Figure 3). These pools discouraged a frontal assault by either side; any effective infantry and cavalry attacks had to be confined to the flanks (McCall 1974 [1868]:453). The spatial distance between the battle lines remained nearly unchanged from what it was before the prairie fire (Berlandier 1846; Duncan 1846).

It was now around 5:00 p.m. The smoke lifted and the artillery duel resumed. Arista's artillery opened on Churchill's two 18-pounders that caused so much havoc on the Mexican line. In response, the 18-pounders opened temporary gaps in the Mexican ranks that closed nearly instantly. Taylor ordered May's squadron, supported by the Fourth Infantry and Ringgold's battery, to turn the Mexican left. May's men advanced against intense cannonading and small arms fire only to meet Torrejón's massed cavalry; May shied from pressing his attack with his 68 dragoons and fell back, losing two wounded men and four horses en route (McIntosh 1846:3). The fight was not totally one- sided. During this phase of the battle, the U.S. Fourth Infantry, positioned next to the 18-pounders now under attack, received "a most galling fire" from the Mexican batteries. The Fourth suffered several casualties, including Captain John Page whose lower jaw was blown off by roundshot. Eventually, this regiment was forced to pull back with May's dragoons and rejoined the right wing.

Childs' Artillery Battalion then moved up to take the place of the Fourth and held its ground between the 18-pounders and the Fifth Infantry. The infantrymen found some protection from the Mexican round shot and canister after their commanders ordered them to sit down in the tall grass (McIntosh 1846:3). While Mexican artillery kept the U.S. right pinned down, Arista ordered his cavalry to attempt another flanking attack. Once again, Torrejón organized his cavalry for a massive charge against the Americans, who crouched in the tall grass for protection. Churchill, in response, turned his 18-pounders against Torrejón's formation, breaking up the attack with canister. Repulsed but not destroyed, the Mexican horsemen then directed their attack on Childs' battalion, now standing and in square formation. The battalion fired a single close-range volley that finally drove Torrejón's men back to the main Mexican battle line position (Taylor 1846:3).

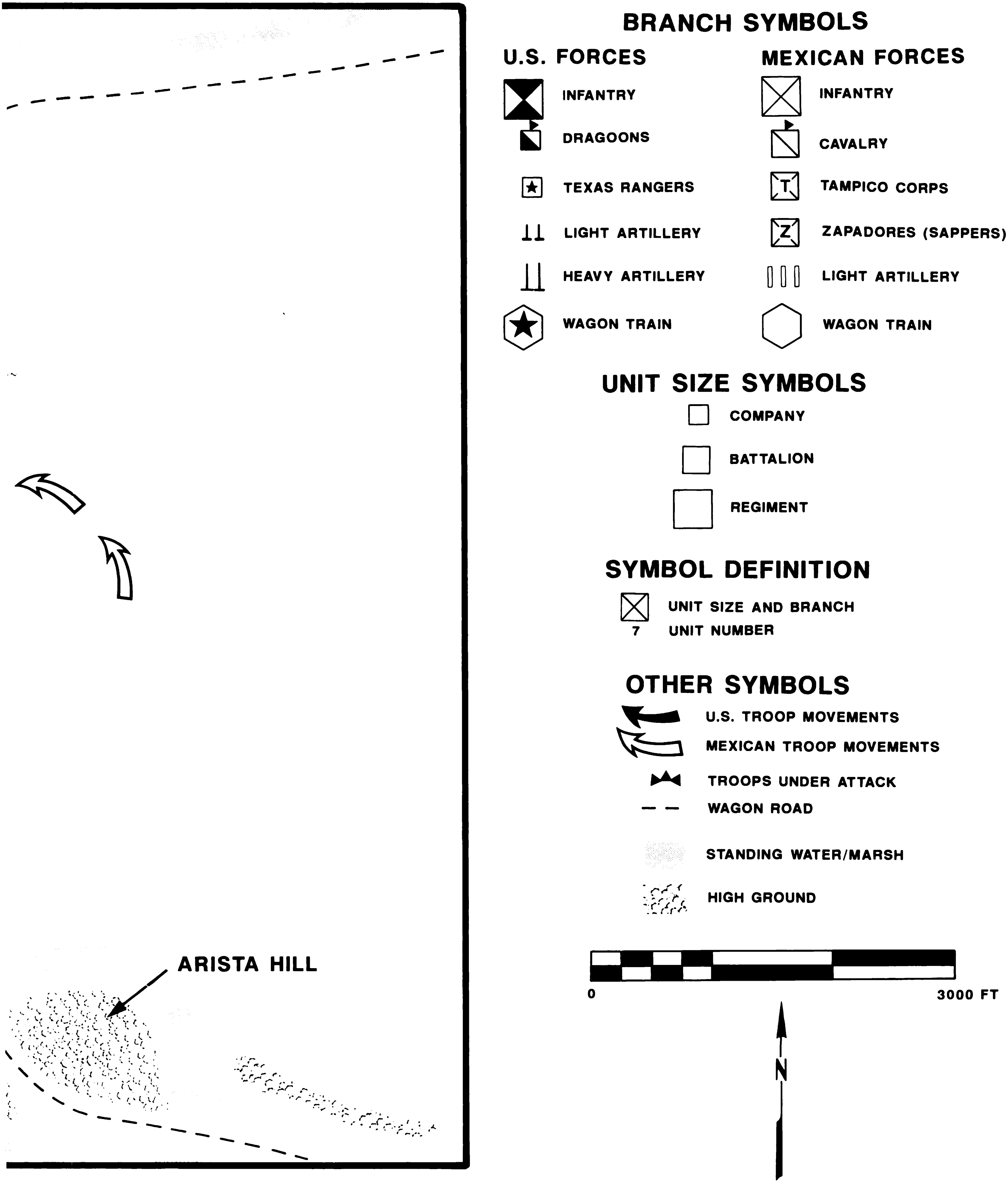
Because of the damage wrought by Ringgold's and Churchill's guns, the Mexican artillery concentrated on them. So effective was the counter battery fire that it drove Ringgold's unit back. During this withdrawal action, Major Ringgold was hit in both legs by a Mexican 4-pounder shot. Although carried from the field alive, he died two days later, aware that his "flying batteries" won the day (Twiggs 1846:2). The Mexican artillery attack continued for well over an hour. By then, they exhausted their supply of artillery ammunition (Bauer 1986:71).

Meanwhile, the Mexican units on the right flank began to waver under the galling fire of Duncan's battery. "The [Mexican] troops at last, tired of being slaughtered for no use, demanded with a shout to be led on to the enemy with the bayonet, for they wished to fight hand to hand, and to die like brave men" (Ramsey 1850:48). Arista granted them their wish. He ordered Montero's light cavalry, supported by the Second Light Infantry, *Zapadores*, and the Tampico Coastal Guards, to turn Taylor's left flank (Figure 14).

Duncan's battery, whose targets had been obscured by grass fire smoke, at that moment was hitching up the guns to go to the assistance of Ringgold. Duncan spotted the emergence of Mexican cavalry from the chaparral and realized that, left unchecked, enemy horsemen could reach the supply train. Duncan quickly shifted his guns to shield the wagons, unlimbered in full view of the enemy and within point-blank range. He placed one section directly in front of the Mexican column and the second section where it could fire canister into the Mexican flank. In his report written four days after the battle, Duncan described what he modestly termed "the important operations of the day":

> A strong body of the enemy's infantry, supported by two squadrons of cavalry, debouched, from the extreme right point of the chaparral, and moved steadily forward to the attack:--one section of the battery opened upon them, with round shot, shells, and spherical case. So well directed, that the whole advance, horse and foot, fell back in disorder to the bushes. The other section played in the meantime upon the masses of cavalry, that had halted at the sight of the guns as before mentioned. Although these shots were well delivered, and each one made an opening through an entire squadron, this part of the enemy's line stood unshaken (Duncan 1846).

The artillerymen were soon joined by Ker's squadron and the Eighth Infantry, but it was the fire from Duncan's battery that forced the Mexicans to break off their attack. The Mexican soldiers tried to return the fire but were frustrated by the setting sun shining directly in their eyes (Ampudia 1846; In Sanchez 1980:20). When the Mexicans finally fell back, Duncan took advantage of the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TEXAS RANGERS
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HEAVY ARTILLERY
WAGON TRAIN
MEXICAN FORCES
INFANTRY
CAVALRY
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TAMPICO CORPS
Z
ZAPADORES (SAPPERS)
LIGHT ARTILLERY
WAGON TRAIN
UNIT SIZE SYMBOLS
COMPANY
BATTALION
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UNIT NUMBER
OTHER SYMBOLS
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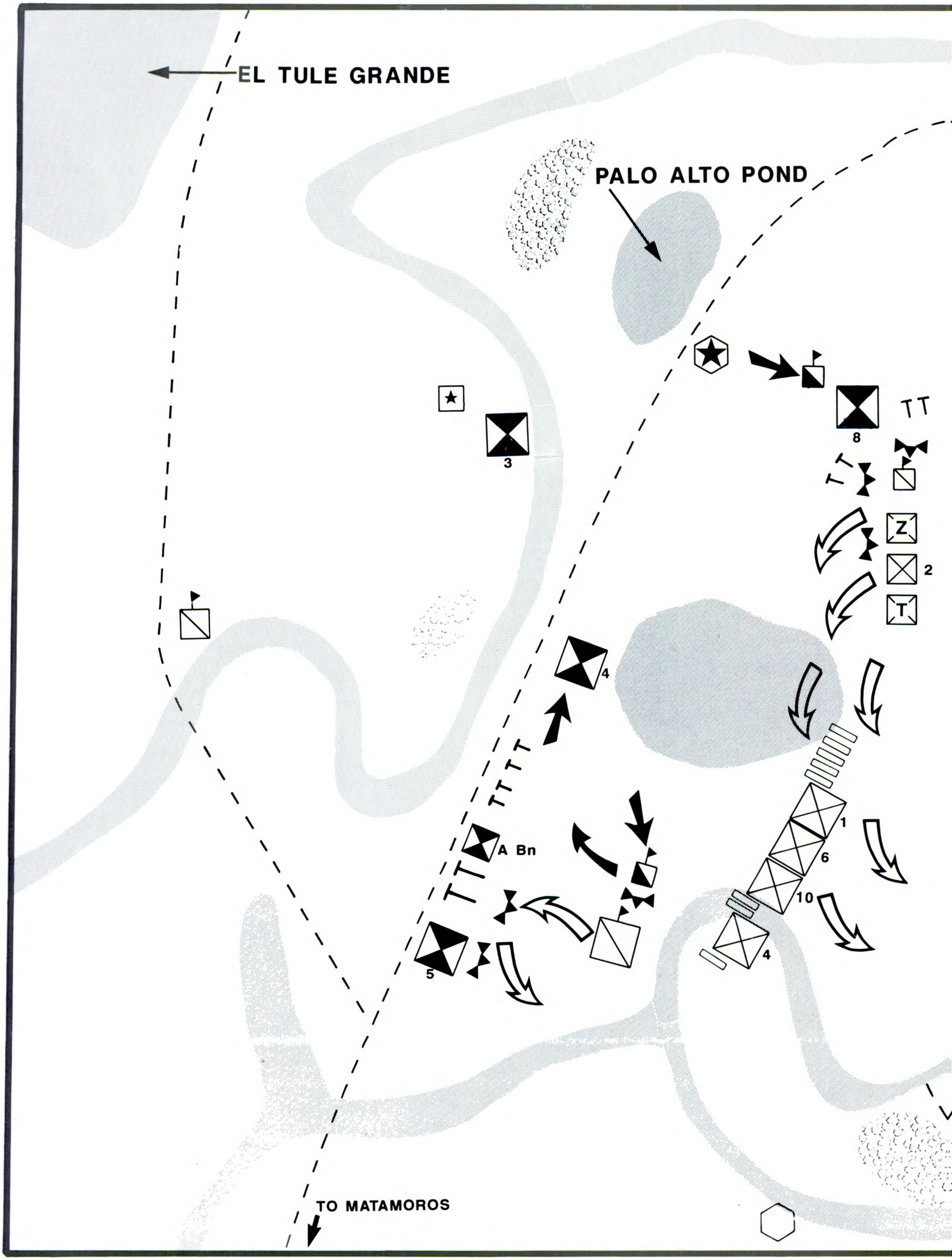
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Figure 14. Final battle lines, approximately 5-7 p.m.

smoke to move his guns unobserved to within 300 yd of the Mexican right flank. From there, he opened an unexpected enfilading fire that rolled back the Mexican line. Noriega's cavalry increased the panic among the infantry by riding through them (Bauer 1974:55). Arista and some of his officers halted the flight, but to prevent a rout ordered a second attack by the broken infantry units, supported by Montero's Light Cavalry Regiment. The Mexican troops were too disheartened to push home the attack and were easily turned aside by a sweep of Duncan's cannonfire along the lengths of their columns. They fled across the front of the Mexican line, taking all the troops as far as the Sixth Infantry with them (Bauer 1974:57).

It was now around 7:00 p.m. Because the Mexican artillery had expended its available ammunition, Arista ordered his army to withdraw onto the mesquite-obscured ground behind his right wing where they would bivouac for the night. This was the time for the U.S. infantry to come in with the bayonet and turn the retreat "into a rout or a roundup". But darkness was approaching, and exposing the train of wagons to the possibility of capture or cavalry raid was unwise. So as the Mexicans fell back to the edge of the trees, Taylor's forces bivouacked. "The surgeon's saw was going the livelong night", as searching parties brought in the wounded (Henry 1950:61). Lieutenant Grant wrote home "We then encamped on our own ground, and the enemy on theirs. We supposed that the loss of the enemy had not been much greater than our own, and expected of course that the fight would be renewed in the morning..." (Lewis 1950:146).

From their camp, the Americans could see the yellow-orange torchlights as Mexicans moved about the battlefield where their comrades had fallen. The Mexicans gave up trying to bury their dead because they lacked pickaxes and shovels. Many of their dead, therefore, were left unburied (Sanchez 1980:21). The wounded were brought to the field hospital for rudimentary care, but the surgeon to whom the medicine chests had been entrusted disappeared with them during the battle; the luckier among the wounded were piled into wagons and sent back to Matamoros. Worst of all, Mexican morale had been dealt a devastating blow.

U.S. casualties at the battle of Palo Alto included 5 killed, 43 wounded and 2 missing; an additional 2 officers and 8 enlisted men later died of their wounds. Mexican losses were substantially higher. Arista admitted to losing 252 killed, while Lieutenant George Meade, after interviewing captured Mexican officers, placed the number closer to 400 (Meade 1913:82; Brooks 1965:36). However, in his official account of the battle, General Arista stated that his army lost only 102 men (Anon. 1846b).

The battle proceeded not as Taylor anticipated since he abandoned his initial plan of a bayonet charge. According to military historian K. Jack Bauer, Taylor's apparent flexibility probably reflected his inexperience as much as anything. Palo Alto was his first large engagement and the first time he had seen the "flying artillery" in action; their performance could not have failed to impress him. Also, the battle was the only time Taylor saw cavalry perform in battle. Their flexibility and speed, theorizes Bauer, "clearly worried a general whose force was hobbled by a large and vulnerable wagon train". This threat to the train and his flanks is the probable explanation for Taylor's decision not to attack (Bauer 1986:73).

In a tactical sense, Taylor's men had won the battle since they held the field at little cost to themselves while inflicting heavy casualties on the Mexicans. But strategically the battle was a draw. Neither side had accomplished its objective: Taylor had not reopened the road to Fort Texas, and Arista had not destroyed the American force.

Post-Battle History

May 9, 1846 to May 8, 1893

Arista's army withdrew the morning after the battle. Taylor's army followed the retreating Mexican force several hours later but only after defensive measures were taken for the U.S. wagon train. (For discussion of the ensuing battle at Resaca de la Palma, see Appendix B, this report). Lieutenant Jeremiah Scarritt, Taylor's staff engineer, reported, "On the morning of the 9th [General Taylor] directed me to secure the train in the best manner possible...by 12 o'clock, I had the train so that it could resist any attack of cavalry--come in what direction it might and it would have required very steady cavalry to have marched upon it" (Scarritt 1846:7). A participant of the 1893 commemoration of the battlefield described these defensive measures as having become "barely traceable earthworks" (Portmess 1893). The earthworks were positioned in the immediate vicinity of the pond where, the day before, U.S. troops, their horses and wagon train livestock got water. Two 18-pounder cannon, two 12-pounder howitzers and a detachment of artillerymen were left with the teamsters for the wagon train's defense (Henry 1847) (Figure 15).

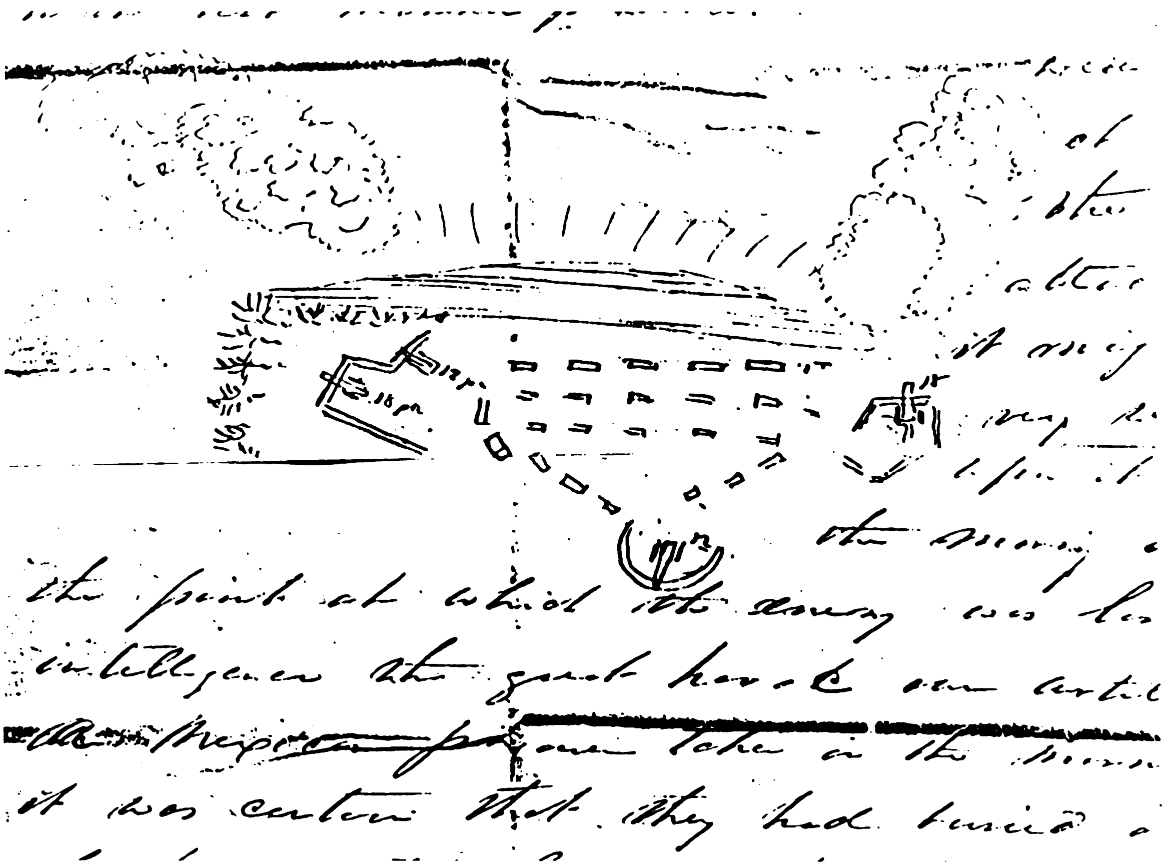

Figure 15. Lieutenant Scarritt's sketch of earthen fortification. Note placement of two 18-pounders and two 12-pounders behind earthen redoubts and abutting Palo Alto pond. Wagons are depicted as rectangles.

A week before the 1893 commemoration, local resident Felipe Martinez, purportedly Arista's guide at Palo Alto, gave a battlefield tour. Martinez described a levee of the resaca as a "ridge" where Taylor halted his army, allowing his men to fill their canteens from the nearby pond. Presumably the wagon road ran along the top of the levee. A newspaper article describing the 1893 commemoration noted "...This ridge is now known as *fortincitos*, meaning little forts. After the battle the army returned to this ridge and erected these forts, three in number..." (*Brownsville Herald*, May 9, 1893).

Champion (n.d.:2) placed one of the three fortifications at the pond facing northwest. The other two, he believed, were to the east and alongside the wagon road. If correct, such placement is suggestive that the two easternmost fortifications were constructed paralleling the wagon road. This probably provided some protection for those wagons still arriving during the battle, not after the battle. Lieutenant Scarritt's account describes the construction of only one fortification after the battle to protect the now consolidated wagon train at the pond. Recent land leveling activities in and around the now dry pond may have obliterated any vestiges of this defensive position surviving after 1893. An inspection of the pond area during the 1992 field season also revealed the presence here of a number of small, shallow depressions. Presumably, these depressions are the result of relic hunters' search for Scarritt's position.

With his wagon train now secured, Taylor began his cautious advance following the Mexican army. The U.S. soldiers marched through the battlefield and the area where the Mexican army had decamped just a few hours before. The grisly remains of the battle left a strong impression on Captain W.S. Henry:

> I took advantage of a halt [of the army] to go over the field of battle. It was truly a shocking sight: our artillery had literally "mowed them down"; there were heaps of dead lying hither and yon, with the most ghastly wounds I ever saw; some had died with a smile on their countenance, others, in the agony of death, with a fierce convulsive struggle had caught at the rank grass, and died with their hands clinched firmly in it, looking defiant at the enemy. It was a shocking picture (Henry 1973 [1847]:94-95).

During this temporary halt Major Belknap placed several of his men on burial detail, interring eleven badly mangled Mexican bodies (Belknap 1846). An official battlefield inspection report, as well as the musings of several of the idle curious, noted the effectiveness of canister and spherical case shot on massed troops. For example:

> I visited the place...where the two 18 pounders were for a time directed, convincing evidence of the skill with which our Artillery was used were still perceptible upon that part of the field, for although [the Mexicans] were permitted to bury their dead, and afterward returned in numbers and spent considerable time in that employment, I counted some thirty bodies stretched out as they fell in that immediate vicinity... (Frost 1859:669-670).

Army Surgeon Madison Mills wrote:

> ...During this halt, which was fully four hours, I took occasion to go over the whole field of battle and saw sights that made my heart sick...Groups of men on horseback, others on foot (camp followers) were riding or running over the field in all directions, looking at the enemy's dead and wounded and picking up trophies of the ever memorable battle of Palo Alto...They left dead on the field at least 200 and from

> appearances must have buried a large number. I saw two large graves newly covered with brush and dirt; in the immediate vicinity of which I found instruments and dressings which told me that some of my own species [surgeons] had been there. What havoc and what horrid wounds our artillery made. I saw heads and limbs severed from their bodies and trunks strewed about in awful confusion. Many a body I saw that had been cut in twain by our 18 pdrs and such ghastly spectacles I hope never to behold again. I picked up a lance and a few other trophies from the field which I hope to retain and take home with me...The 1st Brigade buried a number of the enemy's dead but there were about 150 left on the field unburied...(Mills 1846).

The American dead were temporarily buried on the battlefield, their grave location(s), like the Mexicans', presently unknown. One post-battle casualty was soon added to the relatively small number of American graves: Topographical Engineer Lieutenant Jacob Blake was accidently killed after the battle when he unbuckled his holsters and dropped them on the ground; one of the pistols discharged, killing him almost instantly. That night, after the Battle of Resaca de la Palma, his body was taken to the Palo Alto battlefield and buried by torchlight (Thorpe 1950 [1846]:147). Major Ringgold's remains were later removed for reburial at his home in Maryland (Portmess 1893). A few days later the battlefield was flooded. This lasted for weeks, due to unusually severe seasonal rains. The more shallowly buried bodies reportedly floated away; others were exposed to the vultures and wolves (Portmess 1893). Thereafter, the battlefield became an object of curiosity for the newly stationed off-duty soldiers at Palo Alto. Collecting souvenirs of the battle probably was their major pastime. Several companies of volunteers joined them later that summer (Champion n.d.:2.). No doubt there were civilians who, while traveling through Palo Alto, stopped to look for mementos as well.

Seven months after the battle a Tennessee volunteer wrote:

> ...Nothing was to be seen on the ground, save the graves, many of which had been disturbed by the wolves and the scattered skeletons of very many who had not found a burial. Those laid as they fell: here in rows, from the sweeping effects of the artillery; there singly, from musketry or bayonet... (Champion n.d.:2).

Except for its occasional use as pasture for Fort Brown's livestock, the battlefield entered a phase of civilian exploitation. On July 14, 1847, the Army of Occupation newspaper, the *American Flag*, published in Matamoros, carried this advertisement:

> Palo Alto House. This house is now open for the reception of guests on the battleground of Palo Alto. Comfortable conveyance furnished from the opposite side of the river, at a reasonable price. Preparation is being made for horse-racing to come off on Sunday next and we advise those who wish to see "lots of fun", not to fail going (*American Flag* 1847, July 14).

The "house" or inn was just off the Matamoros-Point Isabel wagon road. Its probable location has been identified by NPS Archeologist Jake Ivey, who noted structural traces and an associated trash dump dating to circa 1845-1855 (Ivey 1992). These traces may be the inn, or one of several houses known to have existed on the battlefield site (Champion n.d:3). An inspection of this site during the summer of 1992 resulted in the location of one copper and one iron ball shot. Since the battlefield is .5 miles to the south, these artifacts probably were dropped by guests of the inn, and not a direct result of battlefield activity. Since its discovery in January 1992, relic collectors have removed artifacts from the inn location (Walter Plitt, personal communication 1992).

According to the above newspaper advertisement, the battlefield was becoming a local tourist attraction. Officers stationed at nearby Fort Brown sometimes gave informal tours of Palo Alto to visitors. Major attractions included the location of the Mexican mass graves and the battle lines, the latter still visible where the cordgrass was trampled down, along with the occasional scatters of horse and human bone (Coker 1992:92-93). U.S. troops were stationed at Palo Alto shortly after the conclusion of the Mexican-American War, no doubt adding to post-battle impact on the battlefield.

A reminder that Palo Alto was still very much on the frontier occurred in May 1849, when a band of Comanches attacked a wagon train as it passed in front of the Palo Alto Inn. The following year 10 robbers broke into a house at Palo Alto, killed the resident and took everything portable (Champion n.d.:3).

In 1853, the Port Isabel-Matamoros road was relocated further to the west. Shortly thereafter, the little community of Palo Alto was abandoned (Champion n.d.:4). During the 1992 survey, archeologists recovered post-battle artifacts, dating to the turn of the century, in relative abundance on or near the presumed route of the abandoned wagon trail. These findings support historical accounts that local ranchers still used the trail, although abandoned as the main route between Port Isabel and Matamoros (Champion n.d.:4).

The battlefield, although now almost literally off the beaten track, was not forgotten. In 1853 President Antonio Lopez de Santa Anna issued a decree calling for commemoration of all Mexican soldiers who had fallen in the war against the United States, including those who had fallen at Palo Alto and Resaca de la Palma. In addition, Santa Anna requested the Mexican war dead who lay in the United States be exhumed and returned to Mexico for a dignified reinterment. Presumably United States officials took no action and there is no documentation of any attempts by private parties to locate and remove Mexican remains.

For the next several decades the battlefield remained essentially as it had appeared in 1846, an expanse of cordgrass bisected by a wagon road, bounded by mesquite thickets and resacas and used as a pasture. On May 8, 1893, a private group of citizens from Brownsville dedicated a monument on the Palo Alto battlefield. The monument, consisting of a marble tablet "like a quartermaster's tombstone", was placed approximately 100 yd south of the barely discernable wagon fortification at the pond (Pierce 1917:30-31).

Post-1893 To the Present

During the early 1900s the Army used Palo Alto and surrounding unoccupied lands as a firing range. Uncounted numbers of 75 mm artillery rounds exploded over the battlefield, scattering their lead ball shrapnel. In later years these lead balls caused some confusion with the battlefield archeological record (Bond 1979:4).

In 1914 General James Parker, commander of the Brownsville Military District, initiated interest in the placement of monuments at historic sites in the Brownsville area, including the Palo Alto battlefield. In a memo to the Adjutant's Office, General Parker described Palo Alto battlefield as..."on an old partly unused route, [the battlefield's] position is unknown to the inhabitants of that vicinity, except a few old persons...[the battlefield] is an open plain covered in places with salt marsh grass..the terrain is flat with a few clumps of mesquite trees which mark the position of some of the old roads..." General Parker also noted in this memo that the 1893 monument was damaged and its inscription partially obliterated "so that even the name of the battle is partly gone". Shortly thereafter, General Parker directed the installation of an upright, Civil War vintage 18 pounder cannon barrel a few hundred feet south of the 1893 monument (Parker 1914). In 1917, a Board of Officers of the First Provisional

Infantry Division convened in Brownsville to determine battlefield locations in the area. The Board toured the Palo Alto battlefield under the guidance of Judge Frank C. Pierce, an historian of the Rio Grande Valley. Pierce's knowledge of the battle was based in part on his interviews of a battle participant named Wabeski (according to Brownsville historian Col. Bruce Aiken it should be spelled Werbiski), who claimed he had been an enlisted man in May's Dragoons (Pierce 1917:105). Neither name spellings, however, appears on muster rolls of any of the units that fought at Palo Alto.

The Board incorporated Pierce's information with what they learned from written accounts (e.g., Ripley 1970 [1849]; Wilcox 1892) to reconstruct the approximate positions of the United States and Mexican battle lines. The Board determined the 1893 monument was correctly placed where the U.S. army initially deployed, that is, immediately south of the old wagon road and the pond. The U.S. army's next position, at the initiation of cannon fire by the Mexicans, was approximately 600-800 yd further to the south and east. The U.S. army's final right flank position was estimated to be approximately 1300 yd further to the southeast, making a partial left wheel (Champion n.d.).

The Board recommended General Parker's monument be moved to a place marking the main action of the battle, that is, the U.S. army's right flank, approximately where the Fifth Infantry and Ringgold's battery repulsed the Mexican cavalry attack. The Board's recommendation, however, was never acted upon. In 1938, Palo Alto battlefield was recorded in the National Survey of Historic Sites and Buildings. The site at the time encompassed approximately 50 acres, located east of the junction of Farm Roads 1847 and 511. These roads were the western and southern boundaries of the battlefield, respectively. In 1960, the battlefield was designated as a national historic landmark by the NPS under the authority of the 1935 Historic Sites Act (NPS 1979). It was around this time that General Parker's cannon barrel monument was moved to its present location, the northeast corner of the intersection of Farm Roads 1847 and 511 and where there is a state of Texas granite marker dated 1936 (NPS 1979).

Although recognized as an historic landmark since 1893, the battlefield underwent various localized land alterations since the early twentieth century. In addition to the exploding 75 mm rounds, there occurred excavations for ponds and a major drainage ditch, damming of a resaca, removal of mesquite thickets, strip plowing for the planting of experimental grazing grasses, placement of a buried natural gas pipeline, land leveling within and around Palo Alto pond, and deep plowing for crops.

Relic collecting has had an immeasurable effect on the battlefield since the day after the battle. As examples, there is an undocumented account of the owner of a battlefield portion who, during the 1930s, removed "hundreds" of cannonballs from his plowed field and dumped them into a resaca (Marian Harr, personal communication 1992); Dr. Vidal Longoria, one of the land owners of the battlefield, related there were two concentrations of cannonballs in one of his plowed fields, but relic collectors took them all during the 1960s (Vidal Longoria, personal communication 1992); and, in at least one instance, a collector resorted to using a backhoe to locate the fabled payroll chest that General Arista somehow managed to misplace on the battlefield (Bond 1979:43). The use of increasingly sophisticated metal detectors by collectors also has resulted in a significant loss of artifacts normally protected by vegetation cover and soil deposition.

Recent Research

In 1974, Texas A&M University Anthropological Laboratory personnel conducted preliminary field studies along several proposed routes for the Brownsville-Matamoros railroad relocation project. The resulting report noted two of the routes would cross the battlefield site, necessitating compliance with the provisions of Section 106 of the 1966 Historic Preservation Act (Shafer 1974). Shafer failed to locate any battle-related artifacts, but did recommend a proton magnetometer survey be conducted to locate and recover metal artifacts and detect subsurface soil anomalies such as burials and earthworks (Shafer 1974:5).

In 1976, the Brownsville Navigation District contracted with the Texas A&M Anthropological Laboratory to conduct intensive investigations on the Palo Alto battlefield. The contract included a documentary research program and a reconnaissance survey of the presumed battlefield area. The resulting report (Baxter and Killen 1976) noted a number of discrepancies in the historic reports and maps of the battle, concluding that "a major portion of the battle occurred just north and northwest of Loma Alta" (Baxter and Killen 1976:55), an extensive low hill situated approximately .5 miles to the southeast of the actual battlefield. Much of this conclusion was based on the assumption that the lead balls found in the supposed battlefield area were deposited by combatants at the battle of Palo Alto. Researchers later determined these were actually the above-mentioned lead ball shrapnel derived from 75 mm artillery rounds. Also, in the opinion of another researcher, none of the other artifacts collected during the 1976 survey could be definitely attributed to the 1846 battle (Bond 1979:4).

Following the authorization of the Palo Alto Battlefield NHS by Congress in 1978, the National Park Service initiated a research project seeking to delineate the parameters of the battle. Reevaluation of the battlefield location problem was prompted largely because of information supplied in 1979 by Mr. A.A. Champion of Brownsville, a longtime student and investigator of the battle. Champion strongly recommended any further research should concentrate on the area commemorated as the battle location in 1893 and 1914 rather than the Loma Alta area. for over 50 years Champion visited the site and, by using an aerial photo with information obtained from eyewitness accounts of the battle, had identified historically significant topographic features (NPS 1979:14-18). Champion's recommendation was independently supported by two previously unknown sources that surfaced at this time: two maps drawn by battle eyewitness Jean Louis Berlandier, which provided views of the locations of the opposing forces as well as some of the area's topographic features; and Lieutenant Scarritt's written descriptions, including a sketch of the wagon fortifications (Scarritt 1846) (Figure 13).

In March 1979, a team of archeologists from Texas A&M and the NPS conducted a reconnaissance level survey of the Loma Alta area and the area identified by Champion as the actual battlefield location. A few battle related artifacts were found, but nothing definitive was determined. The NPS decided to conduct an intensive archeological survey, including the use of a proton magnetometer, metal detectors, aerial photography analysis, and limited test excavation. Accordingly, Texas A&M developed a research design accepted by the NPS. Fieldwork followed during June and July 1979. The final report, *Palo Alto Battlefield: A Magnetometer and Metal Detector Survey*, by Clell L. Bond, was submitted to the NPS in September 1979.

According to Bond (1979:58), this survey failed to produce large quantities of statistically testable information; archeologists only recovered 20 artifacts directly attributable to the battle. This was not enough artifacts to address the specifics of the survey research design. However, it did meet the overall project purpose, that is, the location of the Palo Alto battlefield by artifactual evidence. Bond concluded use of a proton magnetometer was inappropriate due to the numerous and recent man-made soil anomalies and the relatively small magnetic variation caused by isolated artifacts. Bond also concluded metal detectors, although potentially capable of locating quantities of artifacts, would be greatly hindered by the existing vegetation (Bond 1979:58). The report recommendations were as follows:

1) to conduct further documentary research and reporting, and examine the Mexican archives;

2) document Mexican arms and accouterments, and especially Mexican cannon ordnance possibly used in the battle;

3) interview and analyze information from individuals who collected artifacts from the battlefield; and

4) further delineate the location of the Mexican and U.S. battle lines by conducting a more thorough field investigation. The report recommended that such survey use metal detectors along a series of north-south transects, incorporating those areas where significant numbers of artifacts have been found.

It was the researcher's experience that the cordgrass, growing in dense clumps often 3 ft across and 4 ft in height, usually obscured the ground surface. Even when mowed with a tractor driven rotary mower, the remaining stiff stubble prevented the search coil of a metal detector from making contact with the ground surface, thus preventing a reliable subsurface survey. Bond recommended 100 percent removal of the sample area vegetation in future site investigation (Bond 1979:58-60).

No further professional archeological investigations of Palo Alto occurred during the next 13 years. However, in 1991, the NPS contracted with Walter Plitt III, Chairman of the Palo Alto Battlefield National Park Committee, to provide provenience information for those artifacts recently located on the battlefield by collectors. The resulting document (Plitt 1992) provided important artifact patterning data, incorporated in this report. In addition, the NPS continued to support historical studies of this battle. This support is especially demonstrated by essential research of the Mexican archives, conducted by NPS Historian Dr. Joseph P. Sanchez (Sanchez 1980; 1985). Also, the NPS assisted the efforts of local interested parties who helped make this park a reality.

All of the above actions ultimately led to the Palo Alto Battlefield NHS Act of 1991 and the preparation of a general management plan. This plan included funding for an additional, more intensive archeological survey of Palo Alto battlefield. The survey occurred during July-August 1992, with a follow-up survey in March-April 1993.

S.
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CHAPTER FOUR

WEAPONS, ACCOUTERMENTS AND THE SOLDIER

The Mexican-American War transpired at a time when many armies of the world were phasing out their flintlock muskets in favor of more advanced percussion weapons. The flintlock ignition system operated on the principle that sparks result when a sharp piece of flint strikes steel. On a flintlock musket, the jaws of the cock gripped the flint, the latter partly padded with a leather or lead patch to secure the grip. With the pull of the trigger, the flint struck a hardened steel frizzen. The frizzen then pivoted forward, allowing the sparks to fall into a small pan of gunpowder. The powder burned, transmitting a spark through a small hole in the gun barrel and into the main powder charge, thus firing the weapon. The discharged projectile was a large lead ball that killed, or tore a gaping, ghastly wound, if it hit an enemy.

Loading and firing a flintlock musket was slow. Holding the weapon horizontally, the soldier pulled the cock back to half-cock and tipped the frizzen forward to expose the pan. He then drew out a cartridge from his cartridge box. The paper cartridge contained a measured amount of gunpowder, a round lead ball slightly smaller than the inside diameter of the gun barrel, usually weighing about one ounce, and often with two or three smaller lead balls, or buckshot, termed a "buck-and-ball" cartridge. The shooter then tore the end of the cartridge open with his teeth and poured a small amount of powder into the pan and closed the frizzen over it. The remainder of the powder was then poured down the barrel, followed by the lead balls and cartridge paper used as wadding, all of which was then seated firmly onto the powder with the ramrod. The flintlock could then be cocked for firing. The entire process required as many as 17 motions, but a trained soldier armed with a flintlock musket could get off two to three rounds a minute if he did not become rattled in the din of battle.

A percussion musket was simpler to load. The soldier poured all of the cartridge powder into the barrel, and then rammed home the lead balls. Then he pulled the cock, or hammer, to half-cock. He placed a small copper or brass cup-shaped percussion cap on the cone, or nipple, and loading was complete. To fire, one simply cocked the hammer and pulled the trigger. The hammer fell onto the nipple, exploding a small charge of fulminate of mercury in the percussion cap, sending a spark through the nipple and into the main charge.

Mexican Firearms

India Pattern Musket

During the early 1830s, the Army of the Republic of Mexico began a program of replacing its worn out Spanish firearms. Mexico was unable to manufacture its own arms due to the dilapidated condition of its national arms factory, and the money needed for repairing the factory's machinery was nonexistent. Fortunately for Mexico, Great Britain possessed a vast surplus of Napoleonic Wars vintage armaments. In addition to captured French arms, Britain had some 440,000 India Pattern "Brown Bess" muskets in its arsenals (Hefter et al. 1958:53) (Figure 16). Mexico probably purchased quantities of these, as well as other, surplus weapons via private arms dealers or the East India Company (Kevin Young, personal communication 1993).

The Indian Pattern musket was a relatively inexpensive, inferior grade firearm that had been manufactured for the British East India Company, hence the name "India Pattern". In 1793 an ill-prepared Great Britain found itself once again at war with France. As a stopgap measure, the East India Company was required to sell all of its muskets to the Board of Ordnance, yet this was not

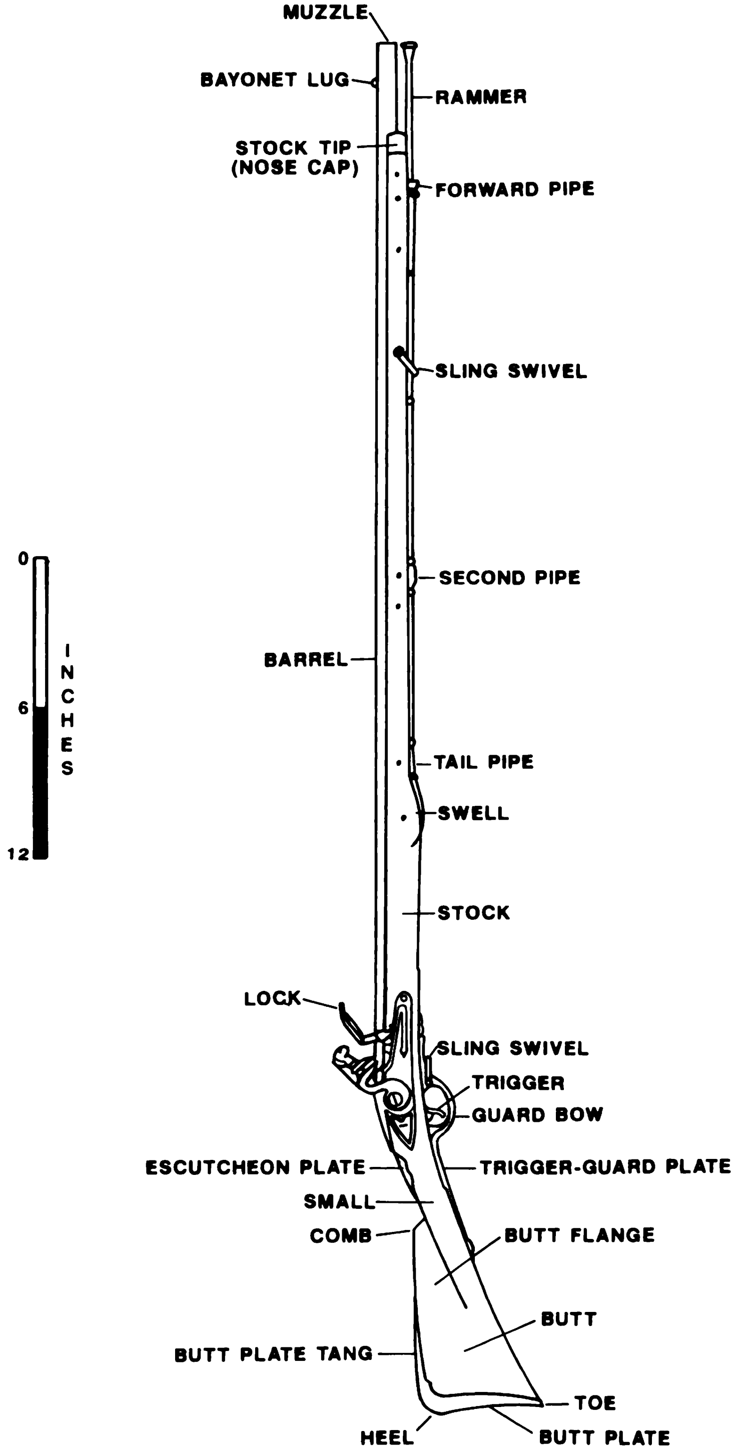

MUZZLE
BAYONET LUG
RAMMER
STOCK TIP (NOSE CAP)
FORWARD PIPE
SLING SWIVEL
0
6
12
INCHES
SECOND PIPE
BARREL
TAIL PIPE
SWELL
STOCK
LOCK
SLING SWIVEL
TRIGGER
GUARD BOW
ESCUTCHEON PLATE
TRIGGER-GUARD PLATE
SMALL
COMB
BUTT FLANGE
BUTT
BUTT PLATE TANG
TOE
HEEL
BUTT PLATE

Figure 16. India Pattern "Brown Bess" Musket.

enough to meet the growing needs of the armed forces. In order to speed up firearms production, the Board in 1797 required gunsmiths to cease manufacturing the superior Short Land Pattern muskets and, in its place, supply exclusively the India Pattern (Darling 1981:50).

The India Pattern musket was inferior in design to the earlier model Short Land musket. The metal fittings were simplified or eliminated and the barrel shortened from 42 to 39 inches; walnut for the stock was inferior grade; and less exacting quality control tolerances was allowed. Nevertheless, it provided a needed relief in the British arms shortage when introduced to the regiments in 1793-1794. Manufacture of the India Pattern continued until the end of the Napoleonic Wars in 1815 (Haythornthwaite 1979:21).

In spite of its substandard quality, the Indian Pattern musket was an effective weapon up to 100 yd. Overall length was 4 feet 7 inches, and weighed 9 lbs 11 oz; the bayonet added another 1.5 ft. and an additional pound. The musket was .75 caliber, and a seasoned veteran could load and fire it several times a minute. Powder and ball, encased in a paper cartridge, were ignited by flintlock mechanism, common to all small arms of the period (Meuse 1965:5).

By the 1830s, the British considered the India Pattern flintlock musket an obsolete weapon, gradually replacing it, by 1839, with the New Land Service percussion musket (Darling 1981:54). Presumably, because of such a huge supply of obsolete flintlocks, Britain chose to sell its India Pattern muskets to Mexico (Koury 1973:8). Furthermore, the British condemned many of these muskets as unserviceable before their sale to Mexico (Hefter et al. 1958:53).

Baker Rifle

The Mexican government purchased the clearance sale-priced India Pattern musket as its main firearm for their regular infantry. It also purchased quantities of the more expensive Baker rifle for their elite sharpshooter troops. Like the Indian Pattern musket, the flintlock Baker rifle was by this time an obsolete weapon, being replaced in the British armed forces by the percussion Brunswick rifle (James 1983:92). The British probably chose to sell to Mexico its oldest, least serviceable versions of the Baker rifle during the early 1830s, since, until 1839, it was still an official British small arm (Hefter et al. 1958:54).

The Baker, first issued to the British Army in 1800, was actually a rifled and more decorative version of a musket. Its initial .75 caliber musket bore was later reduced to a .625 caliber bore; this was the version purchased by Mexico. It had a 30 in. barrel mounted with a trigger mechanism made of brass instead of steel, as was the British musket. Also distinguishing the Baker rifle was a brass trigger guard that curved down away from the stock to form a type of pistol grip more accurate for shooting (Meuse 1965:10). Rifle fittings included a brass lidded patch box in the butt, and later patterns incorporated cleaning tools in the butt box as well (Haythornthwaite 1979:24).

The Baker rifle weighed 9 lbs 8 oz, minus the 2 lb bayonet. Like all rifles of this period, loose powder and ball were normally used with the Baker. The powder, carried in a flask or horn, was measured and poured into the muzzle. The .615 caliber ball, encased in a patch of cloth or leather, was pushed home with a ramrod. As the loading process required some time, the trained rifleman was capable of only about one shot per minute (Meuse 1965:10-12). For situations requiring more rapid fire, the Baker sharpshooter used prepared cartridges intended for the Baker cavalry carbine rifle. Without a patch for the ball, however, there was not a tight enough fit for accurate firing; the Baker rifle then became nothing but a short barreled, highly inaccurate musket (Meuse 1965:12).

Although slower to load than a musket, the Baker rifle was considered accurate for its time. A marksman in the British Army using the Baker rifle was expected to hit the enemy's cross-belts up to 200 yds and his head and shoulders thereafter (Haythornthwaite 1979:25). The Mexican Army provided the Baker rifle for their elite companies of *cazadores* (light infantry) and *grenaderos* (grenadiers) of the line battalions (James 1983:91). They also purchased Paget rifled carbines for their cavalry troops (Nesmith 1986:67). However, due to limited training, the Mexicans could not exploit the rifle to its full advantage (James 1983:91, 92).

Paget Carbine

The Paget flintlock carbine was the primary arm of the British cavalry until at least 1815, the end of the Napoleonic Wars. The Paget was still in use by the British until the 1830s, when it was replaced by percussion carbines. Distinctive features of the Paget are the short barrel length, the swivel ramrod and the bolted lock with raised pan. Some of its brass furniture was exactly the same as that on the India Pattern musket, such as its upper ramrod pipe (Samuel Nesmith, personal communication 1993).

Escopeta

The *escopeta*, called a "scuppet" by U.S. soldiers, was a blunderbuss-type firearm used by Mexican cavalrymen who presumably were not issued the Baker carbine. This weapon used the antique-style *miquelet* lock characteristic of seventeenth century and early eighteenth century Spanish small arms. Unlike the firing mechanism of later flintlocks, the *miquelet* lock had a robust hammer able to hold irregularly shaped lumps of flint. Ideal for use by irregular light cavalry, almost anything could be rolled down the flaring-mouthed short barrel. The *escopeta* often had the "Catalan stock", an archaically-shaped butt with a square-cut end and "hook" on the underside (Haythornthwaite 1979:23). *Escopetas* saw long and hard service on the Mexican frontiers, a firearm often subjected to crude repair work with a corresponding loss in its overall effectiveness (Brown 1980:172).

Pistols, U.S. and Mexican

Mexico also purchased quantities of British flintlock pistols (Nesmith 1986:67), also presumably obsolete and condemned Napoleonic Wars surplus. During those wars, Britain manufactured a wide variety of pistols in pistol- and carbine-bore. Barrel lengths varied from the 12 in "Heavy Dragoon" pistol, to the 9 in "Light Dragoon". There also was an East India Company variety. The common "Land Pattern" pistol had a swivel ramrod; another pattern was the 9 in-barreled, carbine-bore pistol with swivel ramrod and raised pan (Haythornthwaite 1979:51). As in all national armies of the time, the Mexican Army only issued pistols to their cavalrymen and officers. Those who could afford it purchased their own brace of pistols, ranging from deluxe percussion versions of regulation patterns to ornate duelers.

The regulation U.S. military pistol of the period was a .54 caliber smoothbore with either a 8 1/2- or 6-in barrel (Figures 17 and 18). Both Model 1836 flintlock and Model 1842 percussion pistols were in service during the 1840s. However, Ordnance Bureau shipping records indicate pistol flints were not provided to Taylor's command between August 1845 and July 1846 (Bateman 1982:34). This is strongly suggestive virtually all of the U.S. pistols at Palo Alto were the percussion model.

Regardless of model, all period pistols had one thing in common: they were quite inaccurate. A veteran British officer of the Napoleonic Wars once remarked that "Pistols...are only a superfluous addition of weight and incumbrance [sic]...We never saw a pistol made use of except to shoot a glandered horse"; another officer noted the range of a pistol was so limited that its discharge was pointless "until you feel your antagonist's ribs with the muzzle", at which range it was easier to use a sword (Haythornthwaite 1979:51).

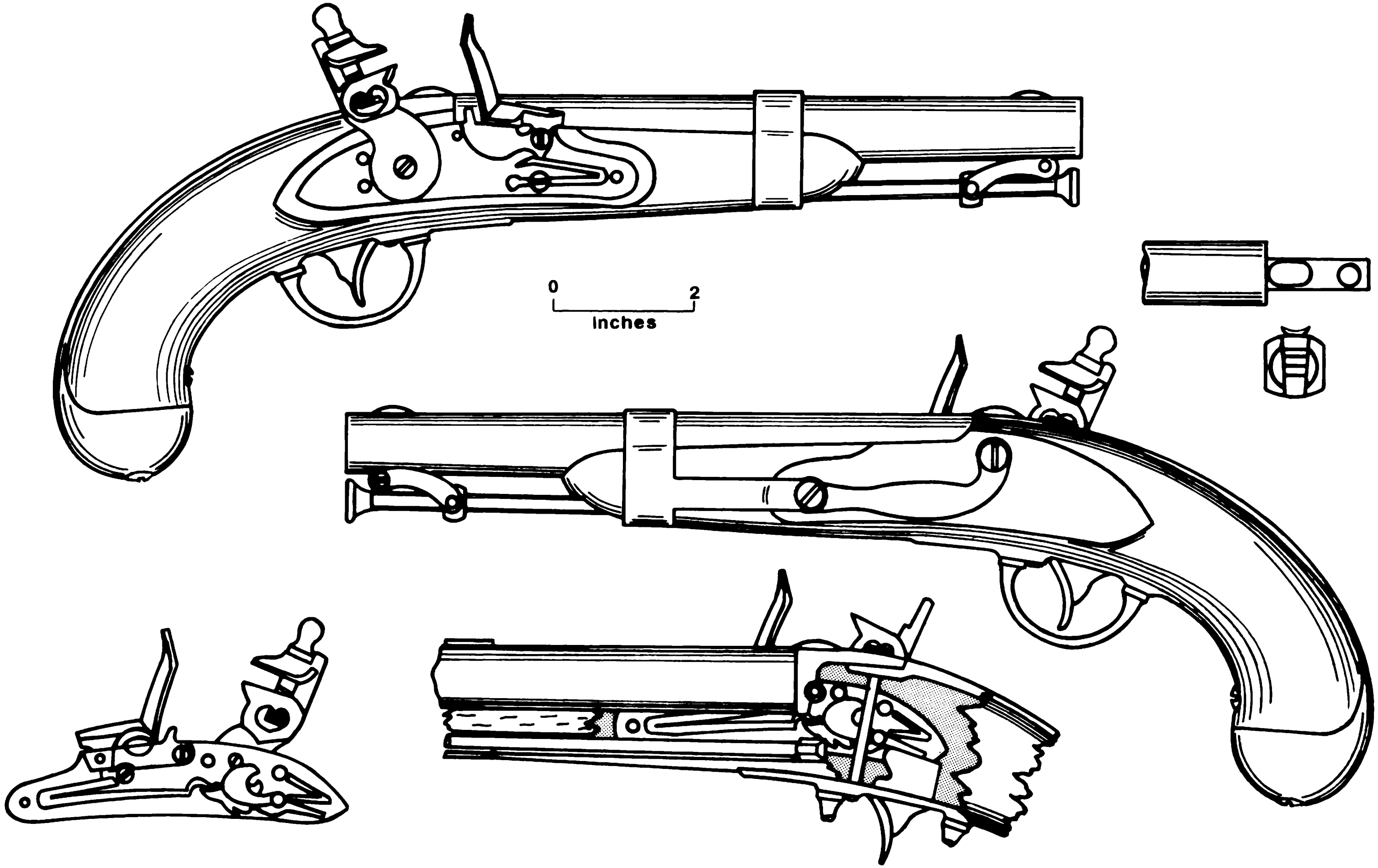


Figure 17. U. S. Model 1836 flintlock pistol. Adapted from illustrations by André Jandot, In Hicks (1940).

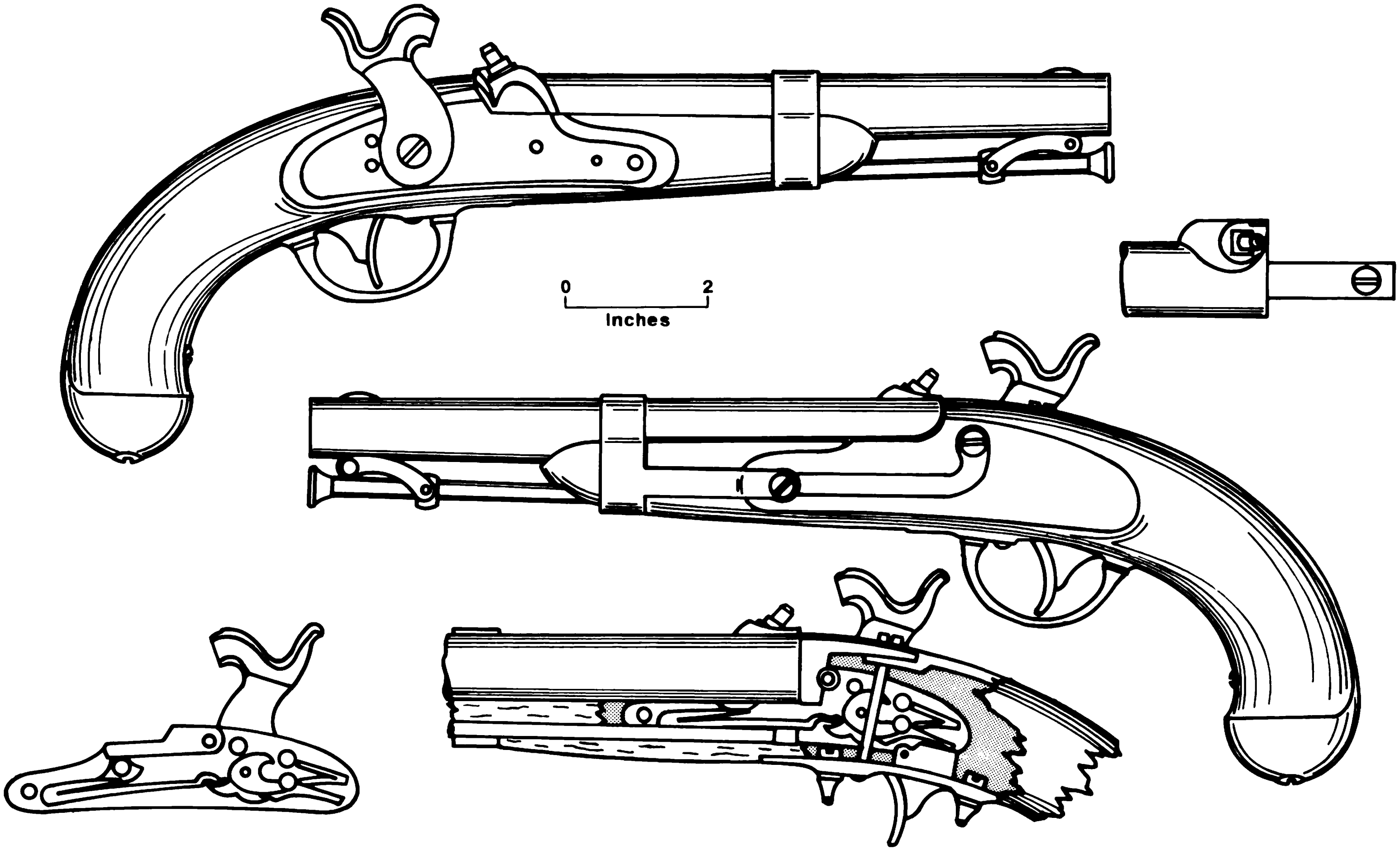


Figure 18. U.S. Model 1842 percussion cap pistol. Adapted from illustrations by André Jandot, In Hicks (1940).

U.S. Firearms

Conversion of existing military flintlocks to percussion design began in 1842. In 1844, the Springfield arsenal began manufacturing percussion muskets and the following year the armory at Harpers Ferry also began producing them. By 1846, these two factories produced over 17,000 percussion muskets; by the end of the Mexican-American War the national arsenals produced over 78,000 more (U.S. War Department Annual Reports of 1846:147; 1848:343). Ordnance Bureau records indicate over 100,000 percussion caps, in addition to 220,000 musket flints and 30,000 rifle flints, were shipped to Taylor's army between August 1845 and April 1846 (Bateman 1982:32-34). Yet Ulysses S. Grant, who was a breveted Second Lieutenant under Taylor's command, stated in his memoirs that the regular infantrymen were all armed with flintlock muskets (Grant 1885:46).

Regardless of the recognized superiority and availability of percussion arms, relatively few U.S. troops were armed with them during the entire Mexican-American War. The reason for this policy is that Ordnance officials did not want the soldiers to fight a war with unfamiliar weapons. Officials believed there was little time to train the troops with the new muskets before their deployment to Mexico, especially since virtually none of the drill manuals then in print addressed percussion arms. Also, officials were concerned an adequate supply of percussion caps could not be maintained. A soldier who lost his flint could use a local source, but a soldier without percussion caps had a useless weapon (Ordnance Board 1846; In McCaffrey 1992:41). Therefore, the U.S. infantry at Palo Alto probably were armed with Model 1816/1822 and possibly Model 1835 flintlock muskets (Figures 19 and 20). The percussion caps probably were for pistols, Hall Models 1833/1836/1842 carbines, and perhaps some refurbished 1819 Hall rifles. Possibly the Model 1841 percussion rifle (the "Mississippi Rifle") was present as a nonregulation firearm, used by the Texas Rangers. It is doubtful any Model 1842 percussion cap muskets were in use at Palo Alto (Stephen Allie, personal communication 1993).

Models 1816/1822 and 1835 Muskets

Models 1816 and 1822 flintlock muskets were virtually the same firearm pattern, differing only in minor variations (Figure 19). Manufactured for the U.S. military until the late 1830s, this weapon possessed the qualities of both sturdiness and excellent design, representing a U.S. achievement in manufacturing machine-made interchangeable gun parts meeting exacting specifications (Butler 1971:34-35). Model 1835 was the last flintlock musket manufactured for the U.S. military, incorporating improvements standardized in the Model 1822 French musket (Figure 20). Production of Model 1835 began in 1839, ending in 1845, even while the U.S. arsenals were already converting from flintlock to percussion design. Due to the planned phase-out of the flintlock ignition system, relatively few (approximately 30,000) Model 1835s were available just before the war (Butler 1971:37); this was not enough to meet the needs of the U.S. armed forces on a wartime footing and a limited budget. Thus, possibly both the 1816 and 1835 models were used in the first battle of the Mexican-American War. According to military historian Steven Allie (personal communication 1992), a new musket model was introduced to peacetime units only after regimental supplies of their serviceable older model became unfit or exhausted; even individual companies, scattered as they were along the frontier, might have different musket models. Fortunately, all U.S. military muskets of the period had the same .69 caliber bore, so at least ammunition could be communally shared, if not always musket parts.

Paradoxically, although the musket was the mainline infantry weapon, it was not subjected to intensive scientific experimentation in this country until the 1840s. In his tests at the Washington Arsenal in 1843 and 1844, Captain Alfred Mordecai found that:

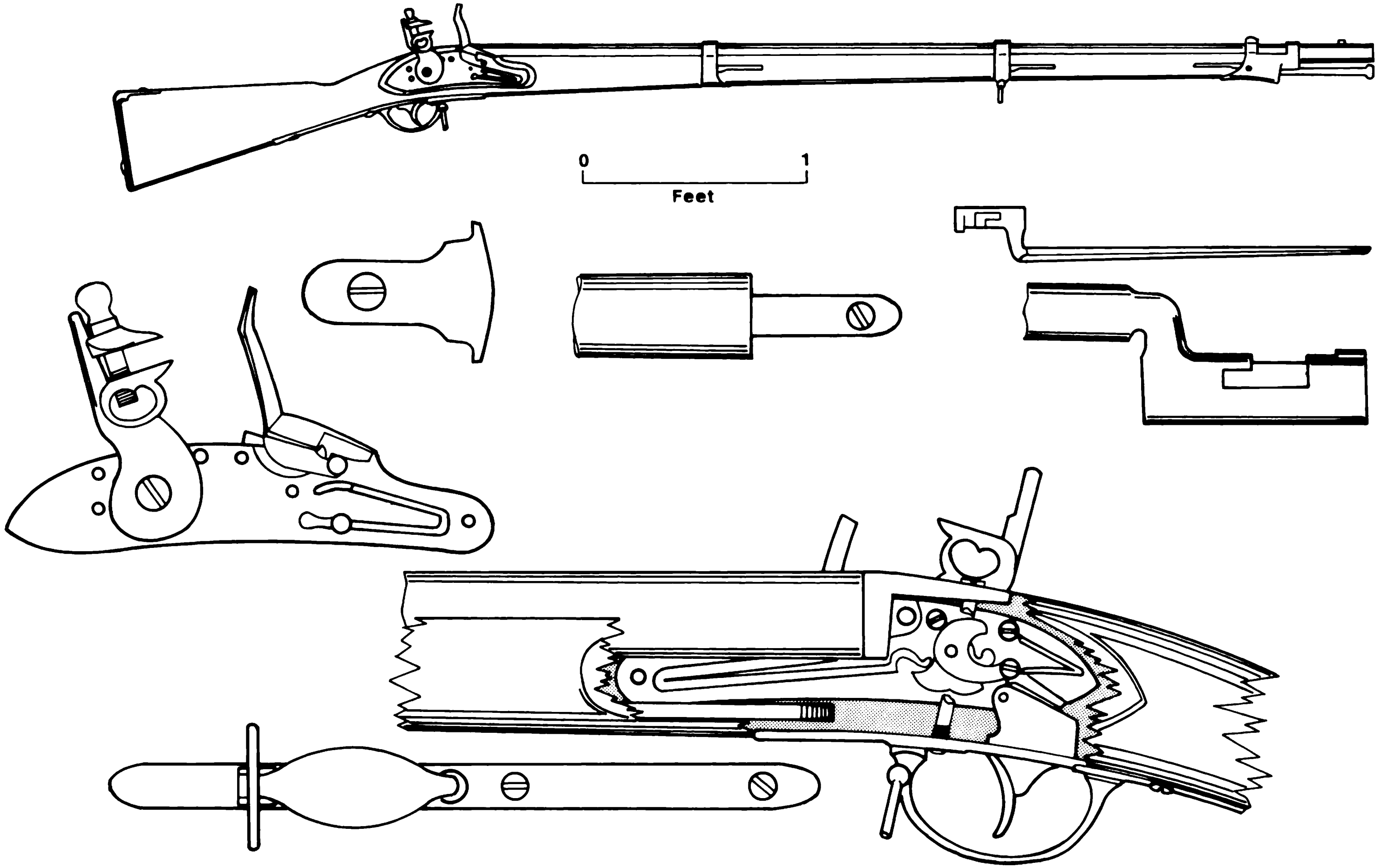


Figure 19. U.S. Model 1816 flintlock musket. Adapted from illustrations by André Jandot, In Hicks (1940).

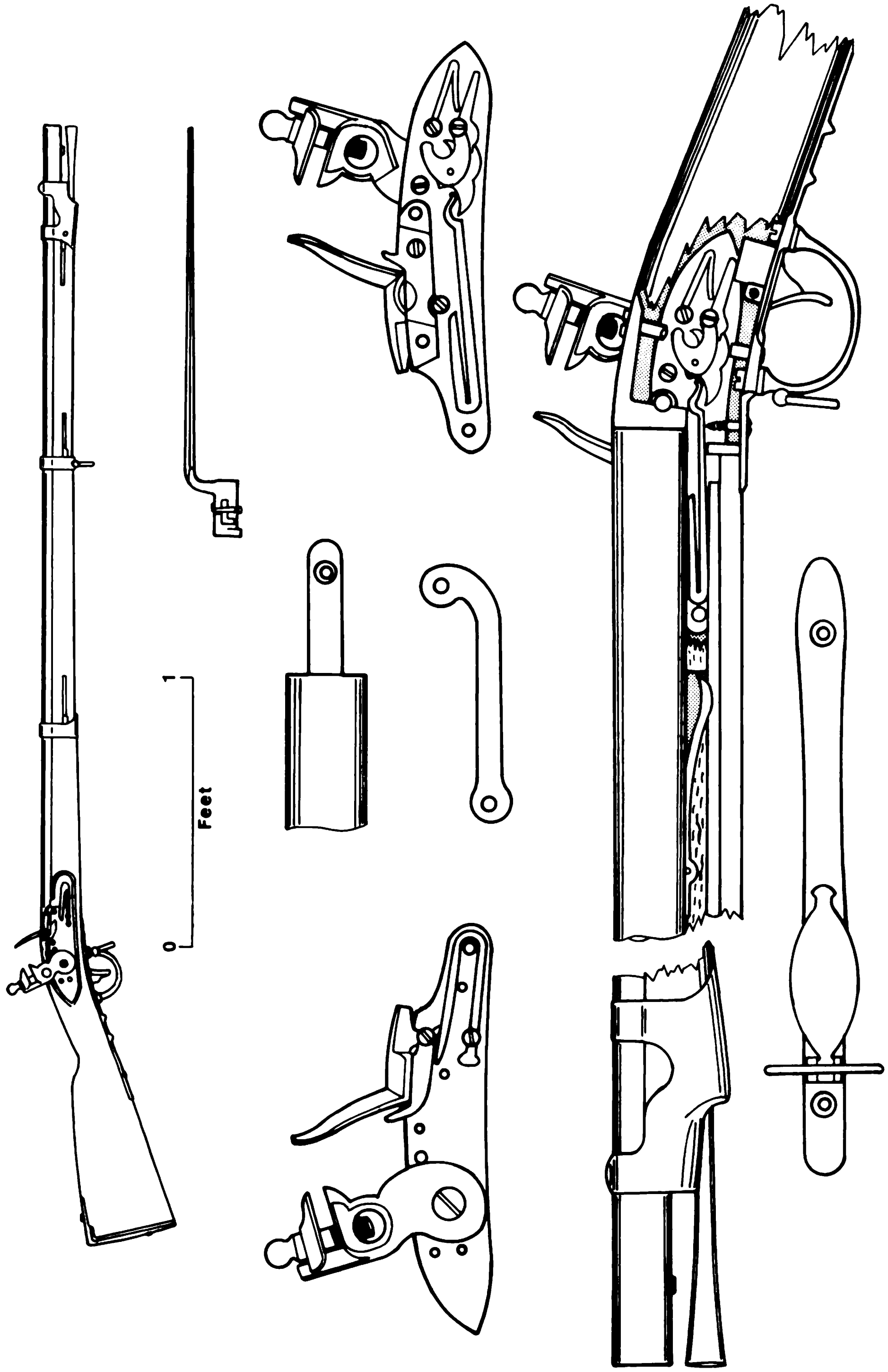


Figure 20. U.S. Model 1835 flintlock musket. Adapted from illustrations by André Jandot, In Hicks (1940).

> ...for the musket, the variation now allowed in the diameter of the bore is...unnecessarily great. But for these arms, a much more important change is that of reducing the windage, by increasing the diameter of the ball...I propose that balls for small arms shall be made by compression, instead of being cast (Lewis 1956:114-115).

An American civil engineer named Bosworth conducted some independent experiments. A strong supporter of rifled arms, Bosworth had some harsh words for the musket in his treatise of 1846:

> In point of model, structure, and proportion...the musket for accuracy of ball-practice may be considered the worst. It is out of proportion in point of size, the caliber being too great for the weight of the piece...A ball projected with a full war-charge, can not be relied upon for any kind of accuracy; and the recoil is too severe for the strength of an ordinary soldier...It is conceded on all hands, that the musket-barrel is too light for its caliber (Bosworth 1846:80-81; In Garavaglia and Worman 1984:112).

The efforts of men like Mordecai and Bosworth soon resulted in changes. Between mid-1845 and mid-1846 the Washington Arsenal turned out a million and a half "pressed musket balls" and a million pressed rifle balls. To improve the cartridge as a whole, the Ordnance Department procured a quarter of a million tinfoil cartridges in 1844, but they did not work well in service (Records of the Office of the Chief of Ordnance 1846; In Caravaglia and Worman 1984:113).

Regardless of cartridge type, the musket used with it was, by the initiation of the Mexican-American War, of uniformly high quality. But a military musket or any other gun performs no better than the soldier shooting it. In touching on this subject, Bosworth noted the musket

> ...is now all it ever has been, and in some points much improved...In the hands of one who has studied its properties, [it] will throw a ball with an accuracy that would surprise a large portion of those who are in the habit of using it. What we seriously want is more knowledge among the soldiery, both of guns and gunpowder...(Bosworth 1846:100-102).

Other small arms ordnance experts of the period echoed Bosworth's comment, but it was not until after the Civil War that the U.S. Army as policy required detailed small-arms training (Caravaglia and Worman 1984:113).

Shotgun

One type of smooth bore sometimes used by soldiers was the common civilian-type shotgun. In fact, the U.S. Ordnance Department issued a total of 43 "double barrel guns" in 1839-1840 (Garavaglia and Worman 1984:114); however, these may have gone to Florida for use against the Seminoles rather than to the West. Yet Captain Reginald Melton of the First Dragoons, who was on the Missouri River in the summer of 1842, carried with him a "large Colt's pistol" and "my old Damascus double-barreled shot-gun" (*Spirit of the Times* Sept. 10, 1842:2). During the Mexican-American War, it was not unusual for officers to carry their personal shotguns into battle since it was a very effective weapon in close-quarter fighting (Garavaglia and Worman 1984:114).

Hall Rifle

Within Taylor's command, Smith's Battalion from the U.S. Fourth Infantry was used as skirmisher/sharpshooters. This battalion was armed with the Model 1819 Hall flintlock rifle (Steven Allie, personal communication 1992). The Hall employed a rectangular breech block, bored from the front with a chamber to accept a .52 caliber round ball and powder charge. Hinged at the rear, the breech block pivoted upward by a finger lever beneath the gun, exposing the mouth of the chamber for loading with either loose powder and ball or paper cartridges. The breech block was then lowered by the finger lever. Between 1819-1833 Hall rifles were flintlocks; between 1833-1844, the last years of their production, they were percussion, in spite of much opposition by hidebound Ordnance officers (Gluckman 1965:173). Also, a great many of the flintlock Halls were converted before the Mexican-American War (Steven Alie, personal communication 1993). Therefore, it is possible some if not all the Hall rifles used at Palo Alto were percussion.

The Hall design was advanced for its day, but the technology to make it genuinely functional and reliable did not exist. By the 1840s, most Hall rifles in service had somewhat worn-out mechanisms, allowing considerable gas and flame to escape at the barrel and breech block junction (Butler 1971:139). Extensive firing increased this to the point where it not only greatly reduced the power and service life of the gun, but also created hazards to the shooter. For these reasons, U.S. troops did not favor the Hall in spite of its great superiority over musket loaders (Gluckman 1965:175).

Hall also manufactured a breech-loading carbine specifically designed for the mounted trooper. The barrel was much shorter, the weight reduced and, on the first two models, the cleaning rod changed into a rod type bayonet with a triangular cross section. The Model 1833 Hall carbine also has the distinction of being the first U.S. firearm with percussion ignition (Gluckman 1965:318-320). Hall's first carbine model was produced as a .69 caliber smoothbore. This probably was due to the conviction that mounted troops generally fought at short range and that the larger caliber smoothbore barrel could handle buck, ball and buckshot loads, thus favoring short-range power and flexibility over long-range accuracy. Later models 1836, 1838, 1840 and 1843 carbines (Figure 21) also included rifled .52 barrels and .64 caliber smoothbore barrels. These later models used release mechanism variations that improved carbine use on horseback (Butler 1971:137).

One interesting advantage of all Hall percussion firearms was that the entire breechblock could be removed and carried around as a very crude pistol lethal at close range. Many U.S. soldiers during the Mexican-American War commonly practiced carrying this breechblock in their pockets while on leave, giving themselves added protection in close quarters (Chamberlain 1956; Butler 1971:138).

Weapons of the Texas Volunteers

Taylor's command included Walker's volunteer company of 75 Texas Rangers that functioned as mounted guides; approximately 25 of these volunteers participated at Palo Alto. Firearms used by Texas volunteers during the war varied since it was a requirement each man provide his own weapons. However, in 1840, the Texas government ordered 1500 muskets of the U.S. Model 1822 from Tryon of Philadelphia. This order proved too large for the republic's treasury. Woefully short of funds, the Texans purchased only 860 of the Texas-marked Tryon smoothbores, each marked with the star of Texas. The U.S. government eventually paid for the other 640 (Garavaglia and Worman 1984:76). In 1843, Captain Philip St. George Cooke and his dragoons overtook a large party of Texas freebooters on American soil and among the arms Cooke confiscated were two "Texas muskets". Beside their 47 rifles and two "American dragoon carbines", the Texans were carrying various other types:

15 English flint lock shot guns;
3 Tower [British musket] pieces;
1 Large American flint lock shot gun;
2 Double barreled flint lock, stub and twist, shot guns;
4 Percussion lock, double barrelled, stub and twist, shot guns;

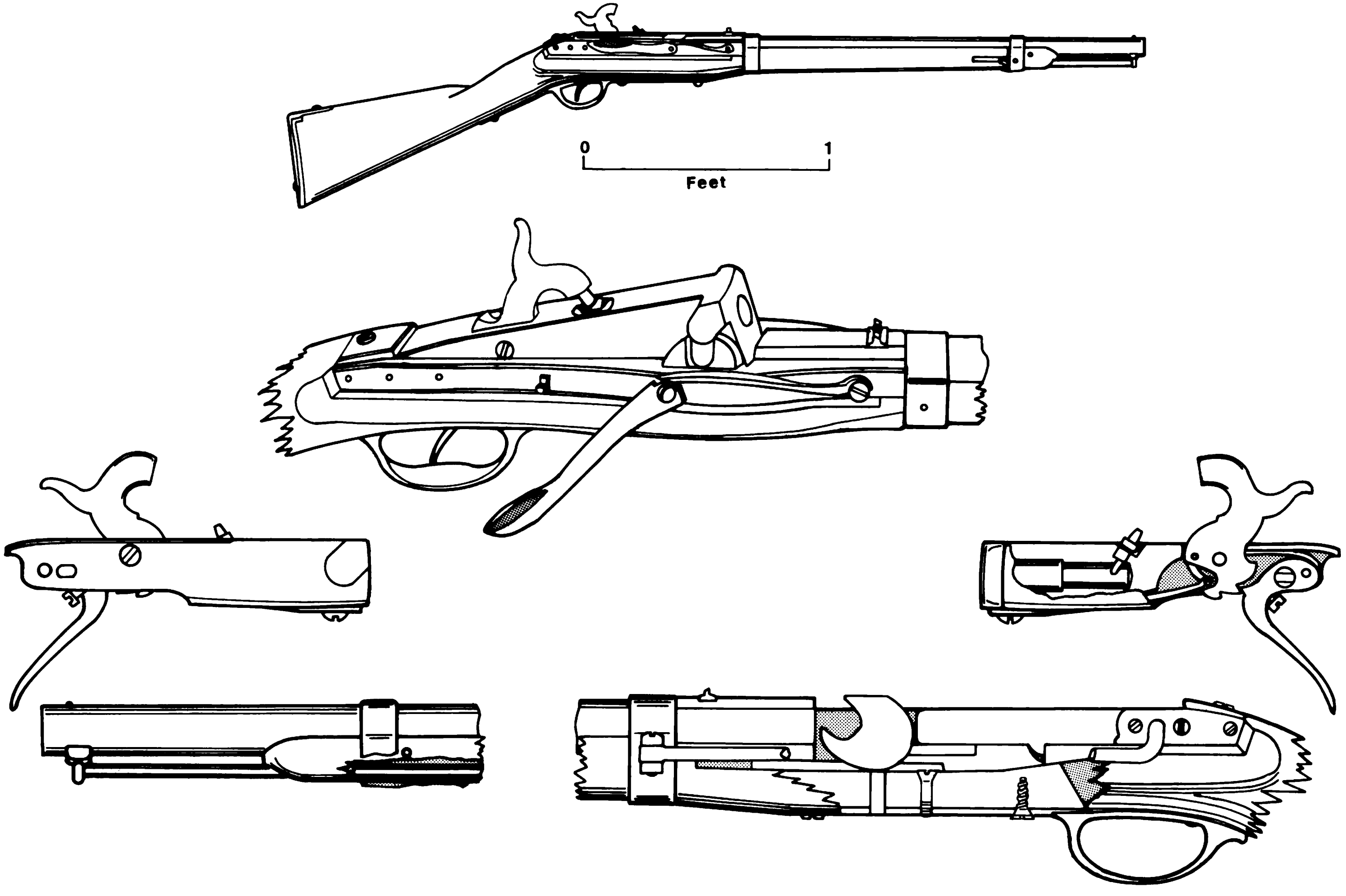


Figure 21. U.S. Hall-North Model 1843 Percussion Carbine. Adapted from illustrations by André Jandot, In Hicks (1940).

1 American musket;
2 Texas muskets [mentioned above] (Nance 1963:92).

The Texans did not use the muskets strictly out of necessity. In describing the 1841 battle with the Mexicans at Mier, General Thomas Green of the Texas forces noted:

> ...some of the men [fell into] the water while crossing the river. One of the strongest objections to the rifle is the ease with which it is put out of order, and the difficulty of refixing it; if the powder should get wet, the difficulty of unbreeching is far greater than the drawing of a musket-load (Duval 1892:41-42).

The Texans' most desirable weapons were Colt's Paterson Arms pistols and carbines, featuring the innovative revolving cylinder mechanism, and the Model 1841 percussion rifle. The latter weapon, later termed the "Mississippi Rifle" due to its valuable service at the 1847 battle of Buena Vista, was used primarily by the Mississippi Volunteers during the Mexican-American War. During the 1840s, these rifles were manufactured by both the military and private contractors but none are known to have been issued to Taylor's troops (Butler 1971:82-83). There is debate whether or not the Texas republic purchased the Model 1841 for its army (Kevin Young, personal communication 1993); however, several of his Texan volunteer possibly had this firearm as their personal weapon.

Other firearms used on the Texas frontier include: the Jenks .64 caliber breech loading flintlock rifle; Jenks .54 caliber flintlock carbine; a variety of shotguns in 10 and 12 gauge; "Kentucky" flintlock rifles; and a variety of captured Mexican firearms, possibly including the India Pattern musket. Taylor may have authorized issuance of the above-described U.S. Army muskets, carbines and pistols to inadequately armed Texans.

Colt's Paterson pistols were used experimentally during the Seminole War in the early 1840s; veterans of that war were impressed with them. Consequently, General Taylor, in 1845, made an urgent request for the purchase of 150 Colt pistols and carbines to equip some of his troops. At least a portion of this requisition reached the army depot at Port Isabel two weeks before Palo Alto (Butler 1971:201). Revolvers were rare and valuable; therefore, 32 of these weapons, perhaps totaling the entire shipment, were issued to those most familiar with them, Walker's Company, much to the chagrin of Taylor's regular officers who apparently coveted revolvers as much for their prestige as for their firepower (Barton 1970:11-12). Since 1839, the Texas Navy had been armed with Colt revolvers and, in 1844, the Texas Rangers had them as well (Kevin young, personal communication 1993). Several models were in Texas service by 1846, in both .31 and .40 calibers. Cylinders for pistols had five chambers; carbine cylinders had 8 or 10 chambers (Koury 1973:43). The depot officer at Port Isabel issued the 32 Colt pistols and carbines to Walker's Company on April 20, 1846. Eight days later 13 of Walker's men in their encampment were surprised by Mexican guerrillas, killing or capturing most of the Texans. As a result of this skirmish, the Mexicans obtained 12 Colt pistols, 4 Colt carbines and 3 Hall rifles as well as boxes of percussion caps and cartridges (Nichols 1963:59).

The Jenks breechloading firearms were far superior in design and performance compared with the Hall breechloaders issued to U.S. troops. Nevertheless, just 100 Jenks carbines and rifles were procured by the military in 1839 for limited trial use; only the inferior Hall breechloader models were issued to U.S. troops during the Mexican-American War despite strong recommendations to the contrary by Army ballistics experts (Butler 1971:141-146).

Edged Weapons

Bayonet

Combining the offensive firepower of the musket with the defensive qualities of the pike, bayonets were considered indispensable by both armies. Santa Anna, in his General Orders for the Mexican attack on the Alamo in 1836, stated that "all armaments will be in good condition--especially the bayonets" (Hefter et al. 1958:33). A few months before Palo Alto, one Mexican general referred to the U.S. soldiers in Texas as "those adventurers [who] cannot withstand the bayonet charge of our foot [soldiers]..." (*Washington Globe*, 15 October 1845). On the day before the battle at Palo Alto, General Taylor reminded his infantry "their main dependence must be in the bayonet" (Wilcox 1892:51). So important did the U.S. army consider the bayonet, that official Ordnance returns sometimes divided serviceable muskets into two categories: "Muskets complete" and "Muskets without bayonets" (Hicks 1940:56).

To avoid the heavy casualties of a prolonged firefight, many tacticians advocated the immediate shock value of the bayonet charge. But charging an unshaken body of troops armed with muskets demanded high discipline; therefore, most bayonet charges were on enemies with low morale. In such a situation, the sight of a yelling mass of men advancing with level bayonets would be sufficient to turn them to rout. Often it was the fear of the bayonet, not the bayonet itself, that decided the battles of this period (Haythornthwaite 1979:27).

The India Pattern musket bayonet consisted of a triangular sectioned, 15 inch-long blade that was attached to a cylindrical socket, allowing for attachment to the mouth of the musket barrel. The bayonet was held in place by a right-angled slot passing over the foresight of the musket. Apparently, this was an insecure method since British soldiers used string and wire to prevent their India Pattern bayonets from being wrenched off by the enemy (Haythornthwaite 1979:26).

The bayonet for the Baker rifle was designed so that it could also be used as a sword. The flat blade was 23 in long, with one cutting edge. The brass hilt had a regular sword guard type, shaped like a "D", with a groove and catch in the side of the handle for attaching it to the rifle. The blade of the bayonet, positioned flat against the axis of the bore, had a tendency to catch the force of the explosion on the cross guard and on the flat of the blade, causing the rifle to whip to the right when fired. Only a few shots loosened the bayonet; after several firings the bayonet was either badly bent or completely broken off. The bayonet had a relatively heavy weight of 2 lbs, which made the rifle difficult to hold steady (Meuse 1965:13).

The bayonets for U.S. Models 1816/1822 and 1835 muskets were triangular sectioned, with a 15 inch blade attached to a cylindrical socket. Unlike the India Pattern bayonet, the U.S. Model 1835 bayonet had a clamping band that prevented slippage. Also, one bayonet could fit any other musket of the same model because of the U.S. method of manufacturing interchangeable parts for firearms (Allie 1991:4). However, a bayonet made for one musket model could not fit onto the barrel of a different model (Stephen Allie, personal communication 1992). Considering the importance General Taylor gave to the bayonet, the interchangeable parts limitation may have encouraged greater musket model uniformity within his command.

The Lance

Mexican light cavalry units used this weapon. There are no known accounts of U.S. Dragoons using the lance during the Mexican-American War; however, at least two squadrons of the Second Dragoons were trained as lancers while stationed at Fort Jesup, Louisiana, during the early 1840s (Rodenbough 1875:84). Mexican lances were 9 ft long including point and socket. The point had the form of a knife 8-1/4 in long with three or four cutting edges separated by concave bayonet-like gutters, a metal crosspiece at the lower end followed by a tube, and two iron straps 3 ft long to screw on to the shaft as added reinforcement to protect against breakage from impact. The shaft was 1 1/2 in thick. Under the crosspiece of the blade hung a two-pointed pennant showing regimental colors; it functioned both as an ornament and to scare enemy horses by fluttering in front of their eyes (Hefter et al. 1958:56). Mounted irregulars usually had lances of cruder design and quality (Stephen Allie, personal communication 1993). The lance was valued for its shock value, similar to that of a bayonet charge, and was especially useful for scouting and pursuit. A lancer, however, was defenseless once the lance point was deflected (Haythornthwaite 1979:52).

Swords

Swords, like pistols, were intended primarily for use by officers, noncommissioned officers and mounted troops of both armies. It is possible that regular troops in Mexican line regiments also were armed with infantry swords of French design, the sword called a *briquet*. Some swords were merely decorative or badges of office, but most were designed to be not only pleasing to the eye but functional as well. The type of sword pattern a Mexican officer might adopt was left more or less to his discretion. If following European custom, a Mexican infantry officer could have armed himself with either the straight-bladed sword or the curved-bladed sabre. Special units, such as artillery, regimental bands and sappers, were issued special sword patterns as an identifier; noncommissioned officers also had distinctive sword patterns. All cavalrymen of the period traditionally used the sabre, its curved blade most appropriate for the mounted slashing-and-stabbing attack. Likely, regulation issue swords and sabres derived in large part from British Army surplus stocks as well as from armories whose contents dated to the Spanish Colonial period. Each enlisted man of the Mexican Army usually carried his nonissue belt knife. Although a defensive weapon, it usually functioned as a tool for camp chores (Nesmith 1986:68).

In 1840, the U.S. armed forces adopted several new sword patterns, primarily copied from French and other European swords. Hickox (1984:6) suggests the need for new-pattern edged weapons was possibly inspired by the 1836-1842 Florida Seminole War although, at the time, there was an attempt to re-equip the armed forces after the European fashion. During the early 1840s, the U.S. Army adopted new swords for noncommissioned officers, musicians and infantry, and sabres for the dragoons. However, Taylor's command was partially equipped with previous models of edged weapons used in the Seminole War and earlier (Hickox 1984:iii). Specifically, military historian Stephen Allie (personal communication 1993) notes the Model 1833 Dragoon sabre was still issued during the Mexican-American War. The heavier Model 1840 Dragoon sabre, nicknamed "Old Wrist Breaker" (Elting 1977:124) was initially imported from Prussia. Not until 1845 were they produced domestically in large quantities. The Dragoon enlisted man's sabre had a slightly curved, single-edged blade and a brass half-basket guard and pommel. The Model 1832 Foot Artillery sword was a short, heavy arm with a straight, 19 in blade with grooves, called "fullers". The hilt was cast brass with a fish scale pattern grip, and the pommel featured an American eagle and shield. Overall, the sword was reminiscent of the ancient Roman short sword (Hickox 1984:15).

Infantry and artillery noncommissioned officers were issued swords with a straight, single-edge blade and a brass pommel and leather-covered wooden grip. Since commissioned officers had to buy their own edged weapons, they were allowed some latitude, expressing personal preferences in styles and decorations. However, infantry, artillery and staff officers usually carried the regulation Model 1840 sword (Elting 1977:124).

Cannon and Cannoneers

Although both the United States and Mexico had their own gun drill and specified numbers of gun crew members, the method of "serving" the gun was reasonably standard and usually involved five specialist crewmen, although in action some of their duties could be combined. Since the late eighteenth century, prepared cartridges had replaced the previous use of loose powder. A further development was fixed ammunition, in which the projectile had a wooden *sabot* or "shoe" that rested upon the powder of the cartridge. The following is from Haythornthwaite (1990:82-83):

> After unlimbering, the gun was aimed by the senior gunner. Direction of shot was achieved by "traversing", that is, maneuvering the gun trail by means of handspikes and brute force. The barrel was then aligned using a device termed a "tangent sight". Once the gun was aimed, the second specialist crewman or "spongeman" swabbed out the barrel with a wet "sponge", a rammer with a fleece nailed on to the head, to clear the barrel of any smoldering residue from the previous shot which might prematurely ignite the next charge.
>
> While the sponging was in progress the third crewman or "ventsman" put his thumb, encased in a leather stall, over the vent at the sealed end of the barrel to prevent the ingress of air which might cause smoldering material to blow back at the spongeman. The fourth gunner or "loader" then inserted the cartridge and projectile into the muzzle of the gun, whereupon the spongeman reversed his sponge and pushed the charge down the barrel with the rammer end of the sponge. The ventsman then inserted a "pricker" down the vent to puncture the cartridge, and then filled the vent with either a length of "quick match" (cotton soaked in saltpeter and spirits of wine) or, more common after 1800, with a quill or paper tube of mealed powder, to establish contact between the charge in the barrel and spark which would ignite it.
>
> The fifth member of the crew, the "firer", then waited until the others had stepped clear before igniting the charge in the vent with a "linstock" or "portfire", a length of burning slow-match in a holder. This communicated with the gunpowder in the barrel which exploded with a loud roar, sending the projectile on its course and causing the gun to recoil sharply. The whole process was then begun anew, as the gun had to be re-aligned after every shot unless the enemy were at virtually point-blank range...
>
> Rate of fire depended upon the time needed to re-lay the gun after recoil. Twelve to fourteen shots per minute could be achieved [according to historian Neil Mangum, this rate is highly doubtful] but this represented a waste of ammunition; in practice two round shot or three canister per minute was about the average. Gunners were careful not to waste ammunition and to fire generally only when the target was visible and not obscured by smoke.

Field battery ammunition used by both the United States and Mexico during this war consisted of four general types for all guns: round shot, shell, spherical case or shrapnel, and canister (Figure 22). Cannon ordnance is a significant artifact category on the Palo Alto battlefield; therefore, it warrants detailed discussion.

Round Shot

Solid round shot was just what the name implies--a solid ball of cast iron. Many considered it to be one of the most useful projectiles during the whole era of smoothbore ordnance. Round shot

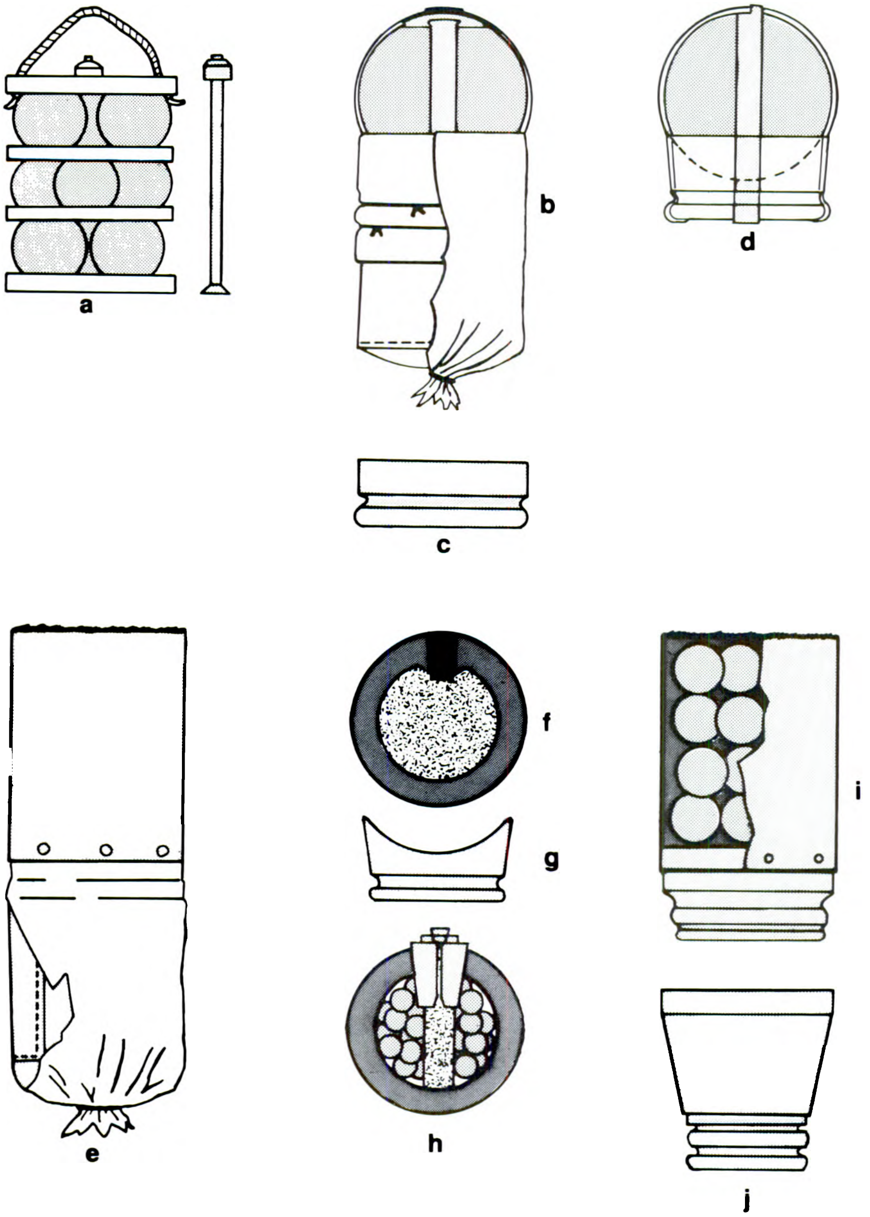


Figure 22. Ammunition for smoothbore artillery. a: stand of grapeshot; b: shell, complete fixed round; c: wooden cartridge block for separate cartridge; d: round shot, tied to sabot with tin straps; e: canister round, fixed; f: cut-away view of shell round; g: sabot for shell round and spherical case; h: cut-away view of spherical case round, showing lead ball shrapnel, wooden fuse plus and burster; i: cut-away view of canister, showing iron shot; j: tapered sabot for howitzer round (powder chamber in howitzers was smaller than the bore). Adapted from Coggins (1962:67).

performed two tasks: 1) it was well suited for destroying walls, carriages, wagons, etc.; and 2) they also were highly destructive when used against men or horses, particularly when the target was in the open and en masse, or could be taken alongside a line of men, termed "at enfilade".

To produce its greatest effect, the round shot had to arrive at its target with a high remaining velocity, and the flatter its trajectory, the more devastating was its impact on either animate or inanimate targets. It was, therefore, normally fired from guns rather than from horwitzers or mortars. Round shot was effective over a considerable range, stretching from well before to some distance after the point of impact with the ground, or "first graze" (a, Figure 23).

Although the muzzle velocities of all smoothbore cannon were similar, the heavier the shot the greater its velocity upon reaching its target. At 1,000 yd from its point of departure an 18-pounder shot velocity is 840 feet per second (256 mps); for a 6-pounder, 450 fps (135 mps); therefore, the heavier the shot the greater its effect. As a result, an 18-pounder shot was three times more effective than a shot from a 6-pounder (Haythornthwaite 1979:59).

A round shot when fired fell steadily from the height of the muzzle until its first graze, about 300 yd for a 6-pounder at 0 degrees elevation; it then bounced or "ricocheted" until it hit the ground again (about 600 yd for a 6 pounder) at the "second graze"; it then usually bounced once more (about 50 yd for a 6-pounder). As the entire trajectory was below man height, anything in its path would be struck down. As velocity and accuracy decreased with bounces, it was ideal to have the first graze on the target, which could be achieved by elevating the barrel. Ricochet was considerably reduced in soft ground; such surface conditions may have existed at Palo Alto due to soggy soil at the time of the battle.

Round shot was much more destructive if fired at enfilade rather than through it (Haythornthwaite 1979:59); Captain Duncan noted in his official battle report that, in addition to shell and spherical case, he also used round shot in his enfilade of the Mexican line. Duncan further noted all three types of rounds he used were "...so well directed, that the whole [Mexican] advance, horse and foot, fell back in disorder to the bushes" (Duncan 1846:314).

> Round shot were unpleasant things to meet in battle. They sliced men and horses in half, and were all the more daunting as they could be seen in flight by the recipient, who was often unable to evade them in the days of close-order fighting. There is a story of 42 Russian Grenadiers having been mown down by one round shot...and one group of 14 or 15 men was observed who had all been killed by the same round shot while standing precisely in the line of fire (Hughes 1969:51).

Round shot, and indeed all projectiles fired from smoothbore ordnance except mortars, were provided with a wooden bottom or "*sabot*". This was a circular plate of hardwood that fitted the bore, and was fastened to the projectile with tin straps. The sabot was largely destroyed as it passed from the bore, but it prevented the shot from rolling or turning over, and was of some value in helping to seal the gases behind it.

Shell

Explosive shell, or "shell" as it was usually called, was the forerunner of the modern and far more potent high explosive round. It was a hollow projectile, with the cavity filled to about 90 percent capacity with black powder. The charge was ignited by means of a time fuse ignited by the flame of the burning propellant charge. Shells were most effective when fired from howitzers, siege cannon and mortars since the stresses placed on the shell were less with those ordnance than lighter field pieces.

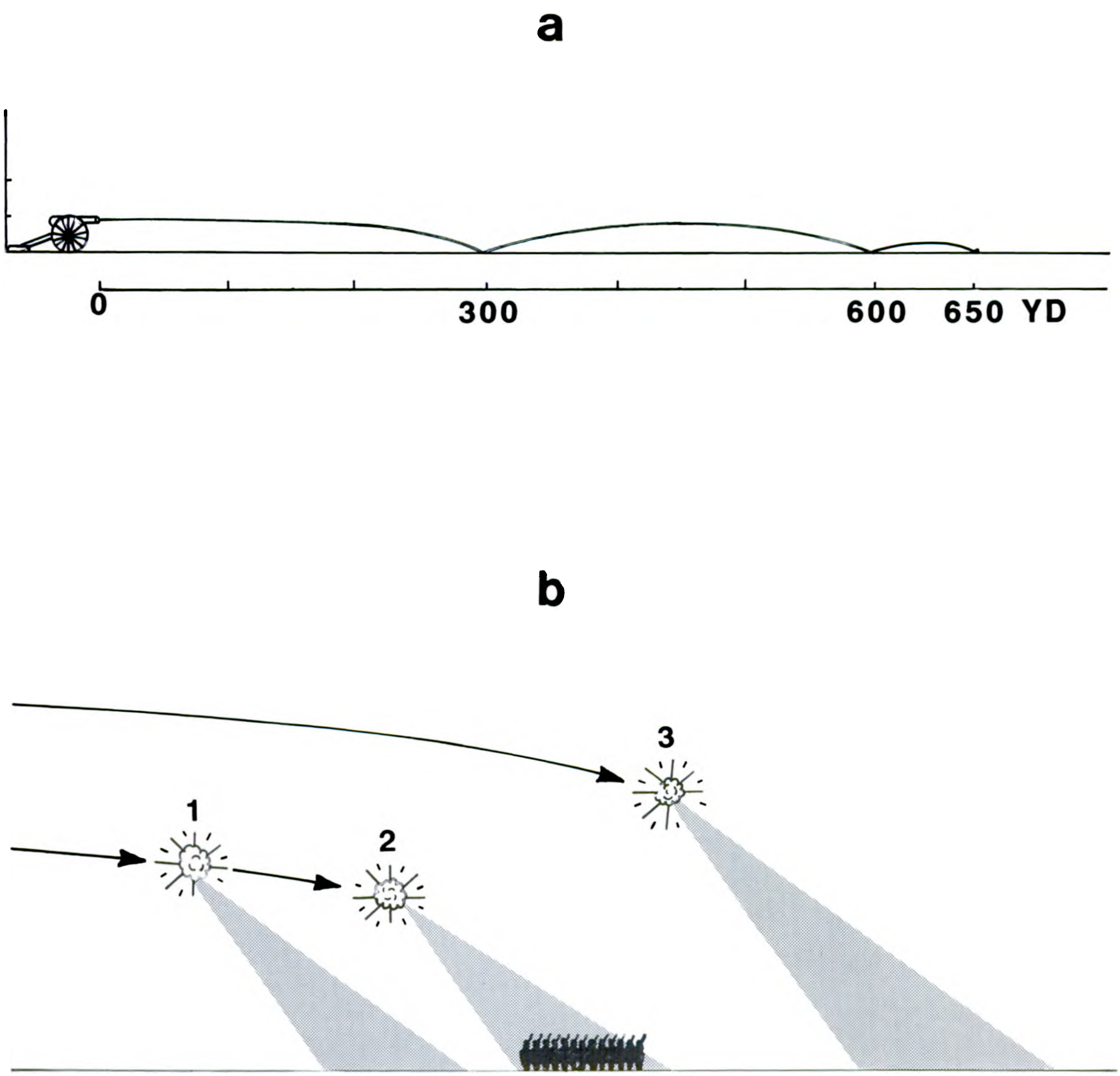


Figure 23. a) Trajectory of a solid round from a 6-pounder fieldpiece at 0° elevation; b) Problems in firing spherical case shot. 1: trajectory correct, fuse too short; 2: trajectory correct, fuse correct; 3: fuse correct, trajectory incorrect. Adapted from Haythornthwaite (1979: 65).

Due to the inadequacies of black powder as a military explosive, fragmentation of the shell for a 6-pounder was limited to only four or five pieces, with correspondingly more fragments from an 18-pounder shell. However, for all of its ballistic weaknesses, the shell round had definite psychological advantages over solid shot; it could unnerve men and horses by its noise and the flash of its explosion as well as by its casualty-producing effects (Naisawald 1960:537-538).

Spherical Case

Spherical case or "case shot" was a form of projectile invented by British General Henry Shrapnel in 1784. It was sometimes referred to by its inventor's name, but more frequently termed case shot or case. It was hollow like a shell except the walls were not as thick, for example, a half-inch for a fieldpiece round. The cavity contained a number of lead musket balls held in a mass of melted sulphur or resin, a bursting charge of one ounce of powder, and a fuse to cause it to burst at the correct point on the trajectory (Hughes 1969:56). The 1849 Ordnance Manual specified 38 lead balls in a 6-pounder spherical case shot; an 18-pounder spherical case shot contained 120 (Mordecai 1849; Gibbon 1860: Appendix p. 35; Bartleson 1973:5).

Case shot was primarily an anti-personnel round and used at ranges beyond the maximum effective range of canister which was 300 yd for 6-pounders firing canister. The manuals of the day stated case shot should be fused to explode 50-75 yd in front of the target and 5-7 yd above it (Naisawald 1960:539) (b, Figure 23). The resulting wide pattern of explosion (for example, 6-pounder shrapnel had a spread of about 250 yd at point-blank range), compensated somewhat for miscalculation of the fuse length. Those unfortunates located directly below the explosion were killed or terribly wounded by high velocity lead balls and iron shell fragments. However, since shrapnel velocity dropped rapidly, the shrapnel thrown the furthest from the explosion might do little more than bruise (Haythornthwaite 1979:60).

Although case shot is much less accurate than round shot, the resounding noise and confusion it made on explosion was at least as significant as any real damage. Case was most effective against cavalry in column by frightening the horses as well as destroying the morale of the men (Gibbon 1860:387). One contemporary account of Wellington's Peninsular campaign stated "...a single shell had been known to kill every horse in a gun team even at long range; and it was a really destructive projectile. The French hated it because they could not reply to it..." (Hughes 1969:56).

The fuse during the Mexican-American War for common shell and spherical case was made of paper, consisting of a conical paper case containing the powder composition, whose rate of burning was shown by the color variant of the paper case. The gunner, therefore, estimated the distance of the enemy from his position, then chose the appropriate fuse for the projectile to correctly explode just over their heads (Gibbon 1860:278; Steven Allie, personal communication 1993).

Canister

The effect of a solid projectile is naturally confined to a narrow line of fire, running from the gun to the target. When engaging troops with round shot, the artillery, therefore, always sought to fire it at enfilade. It was not very effective against troops assaulting a position frontally and, to deal with that situation, the canister shot was developed. As the name implies, this projectile consisted of an elongated tin container the same size as the bore; inside the container were cast iron balls packed in sawdust. By the time of the Mexican-American War, U.S. Ordnance specified 27 iron shot in 6- 12- and 18-pounder canisters. However, shot diameters for the three canister sizes were different: for the 6-pounder canister, shot diameter was 1.15 in; for the 12-pounders, 1.07 in; and for the 18-pounder, 1.68 in (Mordecai 1841).

The canister held its contents together in the passage up the bore and prevented too wide a spread at the muzzle. Upon explosion of the propellant, inertia forced the balls to shatter the face of the container as it hurtled down the tube, producing a swathe of balls over the whole frontage of the gun position from which it was fired. This was most effective, but only up to its maximum range (for example, about 300 yd for 6-pounder guns), since the remaining velocity of the balls was not high enough to do damage beyond that distance. Canister shot was, therefore, primarily a defensive weapon, although there are many recorded instances of its being used on the attack, such as by Duncan's battery at Palo Alto. Canister was a fearsome charge for infantry to face; closely packed lines of charging men were particularly vulnerable to the shotgun-like blasts of such rounds.

Two canisters could be, and often were, fired simultaneously from one gun or howitzer during the last stages of an enemy attack. There is a famous quote of General Zachary Taylor at Buena Vista when he supposedly gave the order: "A little more grape, Captain Bragg!" Alfred Pleasanton, who was there and overheard the actual conversation, reported the order went something like this:

> "What are you firing, Captain?"
> "Canister, sir".
> "Double or single?"
> "Single, sir".
> "Then double it and give 'em Hell!" (Peterson 1969:107)

Grapeshot

Grapeshot is mentioned by many contemporary writers, usually confused with canister. Genuine "grape" consisted of nine, 2.4 inch diameter iron balls packed around an iron column attached to a circular iron base, the whole covered with painted canvas tied with string, giving the appearance of quilting. Since 1841, U.S. Ordnance reserved grapeshot for naval and coastal cannon because it was not as efficient against personnel as canister, and because of damage it caused to the bore of brass guns (Peterson 1969:107; Haythornthwaite 1979:61). However, since U.S. 18-pounders were rated as both siege and coastal guns, grapeshot may have been present within the 18-pounder munitions chests at Palo Alto. The term "grape shot" was informally used by non-artillerists during the muzzle-loading period to describe the smaller shot within the canister and spherical case rounds. One should not presume battlefield accounts are describing grape shot as defined by artillery manuals of this period. Of course, since one's enemy presumably adhered to a different manual, U.S. infantrymen may have experienced, on occasion, "the real thing".

U.S. Artillery

U.S. artillery dominated Palo Alto, and its dominance continued throughout the Mexican-American War. At the outset of the war, the U.S. had an elite corps of artillery unexcelled anywhere in the world. This was achieved through a program that developed a whole new family of artillery pieces of the most advanced design. The artillery, in turn, was commanded by a new generation of professional officers provided by West Point Military Academy and the Artillery School at Fort Monroe, Virginia (Dillon 1975:ix).

Undoubtedly, the light or "flying" artillery batteries at Palo Alto ensured victory for Taylor's small command. Large credit is due to Major Samuel Ringgold who, years earlier, developed the tactic of rapidly deploying the new light artillery in support of infantry. Also, the unorthodox use of two 18-pounders in the forefront of battle, albeit slowly pulled by teams of oxen, gave unusually heavy support by decimating Mexican infantry and cavalry formations.

U.S. artillery in 1845 was organized into four regiments with 10 companies in each regiment, serving as separate companies occupying widely scattered posts. Company strength varied, as did training and equipment, but disciplined career soldiers filled their ranks. A select few trained with the new light 6-pounder gun companies known as "flying artillery" (Grant 1885:44). These served apart from the rest of their arm, a fact emphasized by the way in which they were routinely identified in reports and orders by their commanders' names instead of their regimental and company designations (Elting 1977:122).

Field service cannon consisted of: the **gun**, long-barreled cannon firing projectiles at high velocities in a relatively flat trajectory; the **howitzer**, a moderately short-barreled, light-weight cannon that lobbed a heavy projectile into an arcing trajectory for a moderate distance; and the **mortar**, a short-barreled cannon firing projectiles for short distances in a very steep trajectory (Dillon 1975:12). Mortars were not used at Palo Alto by either army; however, they were present at Fort Texas, and used by Mexican forces during their siege of the fort.

By 1845, the U.S. Army possessed various types and calibers of the newly developed field, siege and garrison artillery; seacoast artillery was not included in the new family of weapons, but were part of the overall weapons system (U.S. Ordnance Dept. 1841:3-5). Of these varieties, only the 6-, 12- and 18-pounder cannon are described below since they were present at Palo Alto:

The 6-pounder gun served as the basic fieldpiece of the U.S. Army. A bronze, smoothbore piece with a maximum range of 1500 yd, the tube weighed 880 lbs and had an outside tube length of 65.6 in. The gun rode a standard two-wheel carriage with a box trail; it featured excellent maneuverability and a rapid fire capability (a, Figure 24).

The 12-pounder howitzer served as the primary field howitzer of the U.S. Army. A bronze, smoothbore piece with a maximum range of approximately 1,000 yd, the tube weighed 785 lbs and had an outside tube length of 58.6 in. The howitzer rode the same standard type of carriage as the 6-pounder gun, and had the same mobility with a corresponding firepower.

The 18-pounder guns within Taylor's train officially were intended for duty as siege, garrison and coastal artillery pieces. These cast iron pieces weighed 4,750 lbs. Normally following behind a battle force in a siege train, 18-pounders had limited mobility and were hauled by draft oxen or mules with civilian drivers (Mordecai 1849:4-6).

Ammunition supply for the artillery presented a logistical problem. Bulk quantities of this very heavy item followed behind the army in slow and unwieldy trains. On the battlefield, a caisson accompanied each field cannon, and limbers pulled by six-horse teams drew both the cannon and caisson. Each limber carried one ammunition chest, and each caisson carried two such chests. Prescribed loads, set according to the type of piece, filled the 600-pound ammunition chests (Dillon 1975:12).

In addition, there was a traveling forge wagon for field repairs and horseshoeing, and a battery wagon for extra supplies. In action these support wagons stayed well to the rear; only the limbers and caissons moved to the front (Peterson 1969:91). Except for the drivers, most gun crews walked behind the drawn equipment to avoid overworking the horses, but they mounted and rode the limbers and caissons when rapid movement was needed. The exception, by most accounts, was Ringgold's Company C, Third Artillery; it was a true "flying" or horse artillery in that each man had his own mount (Elting 1977:122). The other light companies with fewer horses were "mounted artillery" (Dillon 1975:19).

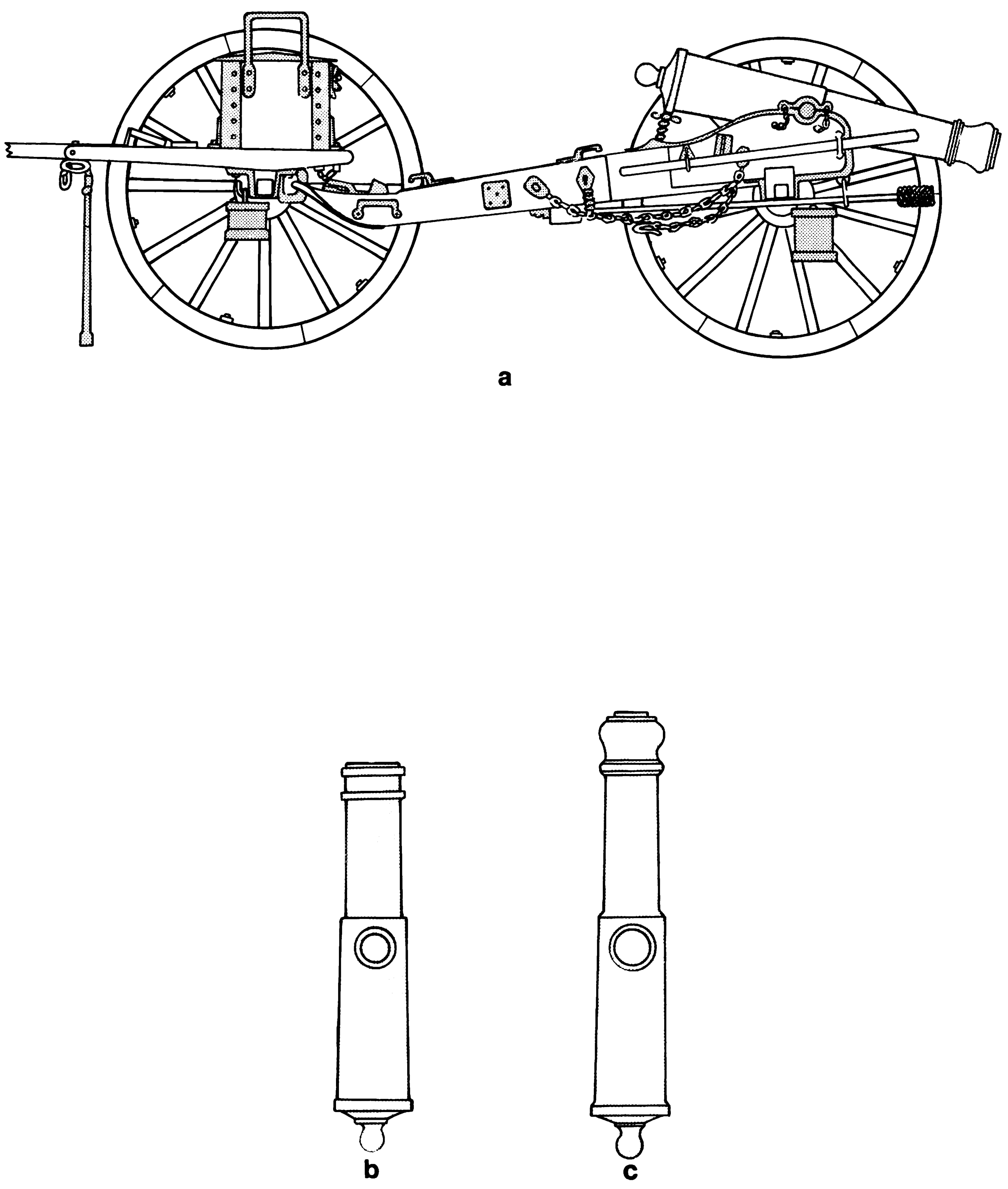


Figure 24. U.S. fieldpiece. a: box-trail style gun carriage with caisson; b: 12-pounder field howitzer tube; c: 6-pounder gun tube. Adapted from Coggins (1962:66,69).

Mexican Artillery

The artillery branch of the Mexican Army also was officered by trained professionals. Many of its senior officers were foreign-born veterans of European wars, and most of its younger officers trained at Chapultepec Military College. At Chapultepec, they mastered the theoretical knowledge of artillery and perfected their gunnery.

Mexican cannon tubes were of mixed caliber, often old and obsolete, sometimes defective from long wear, thus potentially dangerous to operate. Gun carriages were mostly of eighteenth century-vintage *Gribeauval* design which, though perfectly serviceable, was heavier and less maneuverable than the "box trail" carriage design newly adopted for U.S. field artillery (Peterson 1969:88-90) (a, Figure 25). Gunpowder for cannon as well as muskets generally was of inferior quality, often propelling projectiles far short of their intended targets (Thompson 1846:173). Another weakness of Mexican field artillery was their poor logistical support and insufficient mobility. To move ammunition and ordnance, civilian carts and drivers were hired as needed. As the drivers were unacquainted with artillery drill and tactics, battery evolutions were awkward at best and moved slowly, if at all, during an engagement (Smith 1919:156).

At Palo Alto, the Mexican army used at least 12 cannon of the 4- and 8-pounder sizes, and grouped into batteries. They fired both iron and copper solid shot and anti-personnel rounds, consisting of small copper ball shot encased in cloth, or in rawhide shrunk tightly around its contents. The Mexican use of copper shot was a curiosity to U.S. soldiers and war correspondents. The gullible believed copper, supposedly unlike iron and lead, could poison the wounded victim; why else would Mexicans use a metal that, in their experience, was more costly than iron? In fact, copper was an abundant by-product of Mexican silver mines. One observant U.S. soldier noted a predominance of copper shot at battles fought within the intensively mined Mexican interior. In contrast, all of the Mexican shot used within or near the coast was imported and thus made of iron (Furber 1848:199-200). In light of this, use of both iron and copper shot by the Mexican army at Palo Alto conceivably reflected the places of origin of their various military units.

Uniforms, Accouterments and the Soldier

U.S. Army

The *Regulations For the Army of the United States* (U.S. War Dept. 1841), are of little value in describing what the regular soldier wore during the Mexican-American War. Instead, details of such dress come from a variety of War Department publications, archives, and the few photographs and paintings by contemporary artists who followed the armies. Unless otherwise noted, the following descriptions are from Elting (1977:120-126):

For fatigue wear in ordinary weather, and for all services in 1846-47, infantry enlisted men were issued a jacket and trousers of sky blue, lightweight coarse wool called "kersey". The infantry jacket had 15 small white metal or pewter buttons decorated with the American eagle; uniform buttons for artillerymen and dragoons were made of brass with the American eagle design. Except for rank identifications, sergeants wore the same uniform. A dark blue cloth forage cap went with this uniform, used by all branches and manufactured in several styles. No insignia or colored bands are known on infantry forage caps (Stephen Allie, personal communication 1993).

Infantrymen wore a white buff leather belt over the left shoulder on which was secured at the center of the chest a lead-filled, brass circular plate showing the American eagle. Another white belt

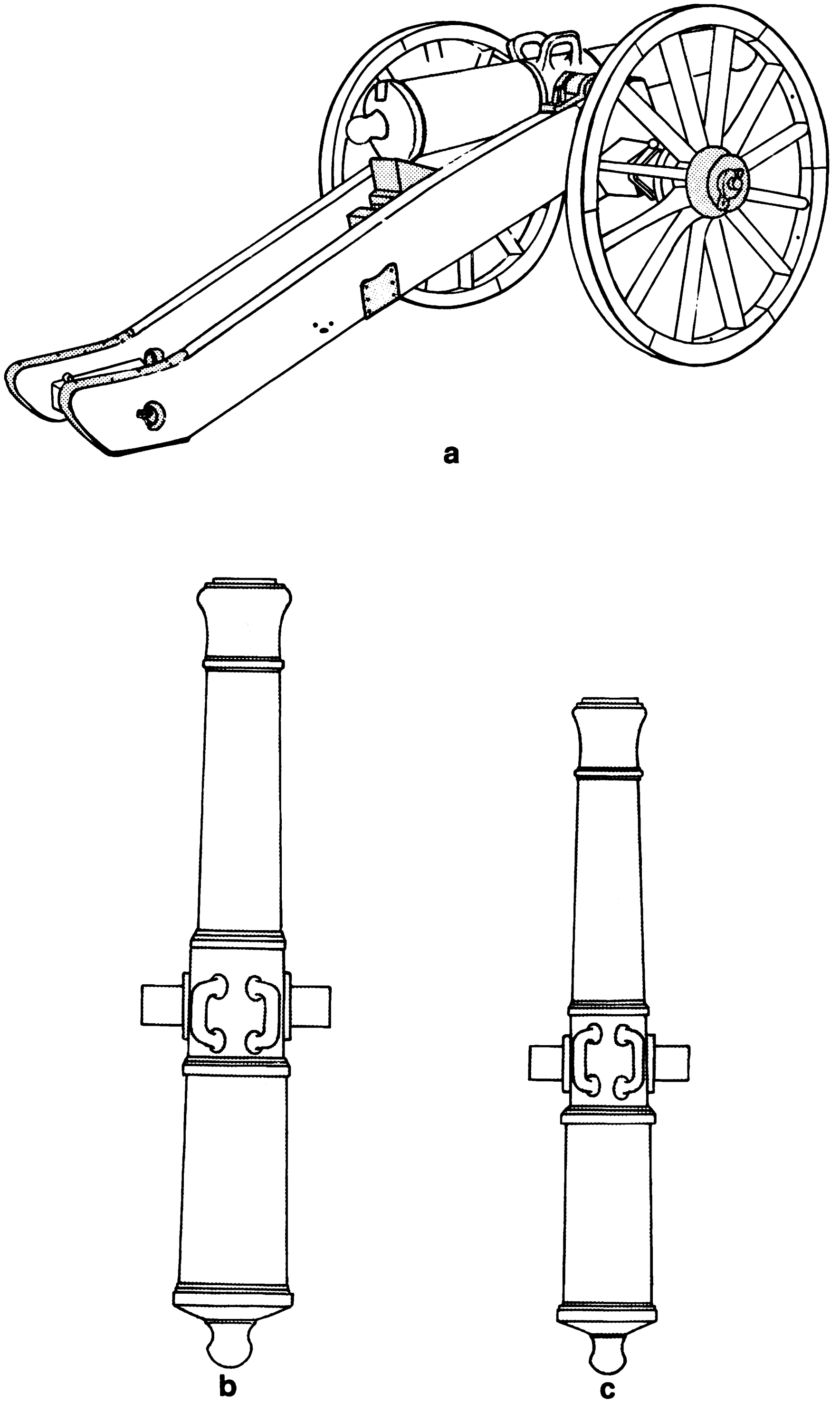


Figure 25. Mexican fieldpiece. a: *Gribeauval* style gun carriage; b: 8-pounder *Gribeauval* gun tube; c: 4-pounder *Gribeauval* gun tube. Adapted from Peterson (1969:61), and Haythornthwaite (1979:58).

was around the waist, secured with a brass plate with raised "U.S." lettering. A black leather bayonet scabbard was attached to the waist belt either by a short sliding sheath called a "frog" or on a shoulder belt; certain noncommissioned officers wore a double frog on a shoulder belt for a sword scabbard. Knapsacks were non-rigid and made of canvas or India rubber, painted black, and marked with the regimental number in white (Elting 1977:120).

Both officers and men carried white cotton haversacks. Their flaps were marked in black to show the wearer's regiment, company and, for enlisted men, their number. In these, the soldiers carried their food. Allie (1991:5) describes cylindrical issue canteens made of tin or wood, an India rubber canteen with a brass spout, and canteens made of sewn leather. All of the canteens held from 2.5 to 3 pt. Mexican gourds were preferred to U.S. issue canteens because they kept water cool on the hottest days (Elting 1977:122).

The cartridge box, suspended on the shoulder belt, was black leather and fitted to carry 40 paper cartridges in tin dividers. On its flap was a round, lead-filled brass plate with a raised eagle. The waist belt was an oval brass plate, also lead-filled, with raised "U.S." lettering. Percussion caps were carried, if carried at all, in special cap pockets on the jackets or in cap pouches. Each soldier, if armed with a flintlock, wore a small brush and a wire vent pricker suspended from a button on the front of his jacket or his cartridge box belt. Infantry line officers in campaign uniform wore a dark blue single-breasted frock coat, sky blue trousers and the same forage cap as the men. While on duty with the troops, a crimson silk sash was always worn. Shoulder straps edged in silver lace indicated rank, and all officers' buttons were silver plated (Elting 1977:120; Kevin Young, personal communication 1993).

Because of their elite status, each of the light artillery companies had special issue uniforms, at least at the beginning of the war. For example, Ringgold's Company C was dressed in dark blue "coatee", a short, close fitting coat with tails, red facings and shoulder knots, and yellow lace and buttons; sky blue trousers worn over short boots; and the "Ringgold cap", which was a shako with red cords and a horsehair plume. By July 1846, these uniforms were wearing out and were replaced with less flashy, general issue uniforms (Elting 1977:122).

The field uniform for dragoons consisted of a dark blue woolen jacket, blue-grey woolen trousers, and a visored, dark blue wool forage cap. Yellow braid decorated the collar and shoulder straps. Officers wore a deep orange sash. Just before the Mexican-American War, both dragoon regiments were reequipped with the new Ringgold saddle. Pistols were carried in covered holsters on either side of the pommel; extra clothing in a valise behind the cantle; and spare horseshoes, nails and grooming equipment in small pouches that hung from the cantle. The rolled "great-coat" was fastened over the pommel.

The U.S. Soldier

Except for a few Texas volunteers, Taylor's forces at Palo Alto were Regular Army professionals. Army muster rolls during the Mexican-American War show the average U.S. regular was approximately 25 years old upon enlistment (McCaffrey 1992:29), and usually from one of the northern Atlantic cities or adjacent interior towns. Recruiters went where they hoped to find prospects. Although the ideal recruit might be a sturdy young farmer, they took what they could find, namely laborers and newly arrived immigrants, who concentrated in northern cities (Coffman 1986:139).

Approximately 40 percent of regular soldiers were foreign-born, many of whom had yet to become culturally assimilated. One captain, complaining that fully one-half of his company did not understand English, observed "...they never could comprehend the difference between the command to 'charge' their muskets, 'charge' the enemy, and 'charge' the United States for services rendered" (Coffman 1986:141). Men enlisted for a variety of reasons: some to escape entangling domestic problems; some their creditors; others saw the Army as a means of existence until the period's economic recession ended; and many immigrants joined to learn the language and customs of their new country. The anti-foreign riots sweeping U.S. cities during this period forced many of them into the Army for their own safety (Katcher 1976:4). A study of soldiers' letters, journals and reminiscences by one historian reveals desires for personal glory and adventure, as well as a need to avenge deaths incurred during the Texas Revolution and subsequent hostilities between the Republics of Texas and Mexico. There also were those who entered the service with the sole purpose of making the government pay for their transportation to the frontier. Once there, these men deserted (McCaffrey 1992:30, 31).

Usually, however, desertion was due to the rigors of war and camplife. During the entire Mexican-American War, more than 14 percent of the regulars (2,850 men) deserted, many of whom embraced the Mexican cause (Irey 1972:296). Deserters, if captured, were usually hanged, although those who deserted before the outbreak of hostilities were lashed on the back 50 times and branded on the cheek bone near the eye with a "D" (Chamberlain 1956:226). Probably the main reason why soldiers deserted was the harsh treatment meted out "at the hand of young snot-nose and tyrannical officers...", and "ignorant and brutal officers". To immigrants who had recently left the British Army, it seemed incredible that "...conceited Yankee subalterns should be free to strike enlisted men at the slightest provocation and inflict painful, humiliating punishments" (Lewis 1950:187-188).

Regular soldiers, unlike most of the volunteers who arrived after Palo Alto, were well-drilled and relatively well-disciplined. When possible, most career officers adequately attended to the welfare of their men. As a result, the rate of fatalities due to diseases caused by unsanitary conditions was significantly lower for regular soldiers than for later volunteers (Smith and Judah 1968:272, 289-290).

At the time of the battles of Palo Alto and Resaca de la Palma, most of the senior officers assigned to the regiments were absent because of age or illness, some of them incapacitated for years but still holding field-grade positions in a regiment, that is, colonel, lieutenant colonel or major. Nevertheless, veterans of the War of 1812 held key leadership positions: For example, Taylor was 62 years of age; McIntosh, 59; Twiggs, 56; Worth, 52; and Worth's second-in-command, Lieutenant Colonel William Belknap, was also 52. None of these commanders attended West Point "...and each was prepared to fight in 1846 as his army had fought in 1812" (Lewis 1950:133). However, also present and in significant numbers were lieutenants, captains and young majors who were products of West Point and years of fighting Indians or serving in some frontier garrison. The pride and determination of these young officers were expressed in letters, diaries and autobiographies. They were resolved to prove the merit of a small professional army in combat against a similarly organized enemy. Furthermore, victory had to be achieved before they could be overwhelmed by volunteers who, they felt, would receive credit for any succeeding victories. Lieutenant Gordon G. Meade was worried they would not get into action fast enough: "We are all anxious to give [the Mexicans] a sound thrashing before the volunteers arrive, for the reputation of the army; for should we be unable to meet them before they come, and then gain a victory, it would be said the volunteers had done it, and without them we were useless..." (Meade 1913:45).

The Mexican Soldier

Authentic pictorial material on the appearance of the Mexican soldier during this period is scant. Unless otherwise noted, Hefter et al. (1958) compiled the following information, largely from printed texts on dress, equipment, armament and accouterment; drawings associated with uniform decrees and contracts were no longer available to the authors. Also, one should realize such uniform decrees specified the ideal. Mexican troops frequently had to be raised by arbitrary methods and organized and equipped in a hurry with insufficient funds. (See Appendix C--Finding a Face: *El Soldado Mexicano*--for further details.)

Many of the principal organizers and leaders of the Mexican military were former officers of the Spanish Army. Under their influence, the Spanish and British patterns of the Napoleonic Era prevailed in tactics, ordnance, uniform, armament and drill. The result was an Army that was "picturesque but somewhat outmoded" (Hefter et al. 1958:50). The Mexican uniform regulations of 1841 specified distinctive uniforms for regular and light infantry, artillery and cavalry units. Infantry uniforms consisted of a tailcoat with cloth facings in a combination of distinctive colors different for each of the 12 line and 3 light regiments. All standing militia companies shared the same uniform design of blue tailcoat, red collar with embroidered company initials, and white pants.

Varying colors, indicating regiment and rank, were displayed on collars, lapels, cuffs, bars and piping. Uniform regulations specified embroidered regimental numbers on collars and stamped on all buttons, yet none of the Mexican buttons found at Palo Alto during the 1992 and 1993 field season were numbered. Likewise, no numbered Mexican buttons have been recovered to date from Texas Revolutionary sites, and only very few of these have the Mexican snake-and-eagle crest. The latter were probably reserved for officers (Kevin Young, personal communication 1993). A brass "0" (FS 295) was also recovered from the Mexican battle line at Palo Alto, the artifact identified as a portion of a regimental uniform insignia for the Mexican Tenth Infantry. This object possibly was worn on a shako (Samuel Nesmith, personal communication 1993). All ranks in the regular army wore plain white canvas pants in the summer and dark blue wool pants in the winter. Boots, if worn, were sometimes covered by buttoned gaiters.

The active militia regiments had been in the field so long there was virtually no difference between them and the regulars. They were ordered, in 1842, to wear dark blue coats with red collars, cuffs, turnbacks and lapels with yellow piping. Trousers were sky blue with red piping, and the regular army shako was to be worn (Katcher 1976:26). Mexico's northern frontier was defended by companies of *presidiales*, eight of which were in Texas. The companies in Texas, including those that fought at Palo Alto, wore blue wool coats with low red collars and narrow cuffs. Their trousers were blue and hats black and broad brimmed. Cartridge boxes were plain brown, and their bandoleers had the presidio name embroidered on them (Katcher 1976:27).

The Dress Regulations describe the military headgear of the Mexican-American War in very general terms. Contemporary illustrations show at least 20 different models of shakos, helmets, caps and hats in use. A typical infantryman shako was a visored black leather cylinder at least 7 in high, with a colored pom-pom, silver cord and tricolor cockade. It was fronted by a brass shield stamped with a regimental number, and had a chinstrap of metal scales fastened by a pair of decorative metal pieces. A typical cavalryman headgear was a brass or leather, combed helmet with a long horsetail, and fronted with a silver Mexican eagle. Soft cloth forage or barracks caps were issued to all Army branches and ranks.

Line cavalry wore standard sky blue coatees with scarlet collars, cuffs, piping and epaulets; plain white metal buttons; and the regimental number on collars. Foot artillery were dressed in blue tailcoat and pants, and the collar was crimson with an embroidered exploding bomb. Engineer, sharpshooter, medical, musician and other specialized units each had their own uniform colors and styles, usually with more brass emblems than worn by ordinary enlisted men. All officers of the rank of colonel and below wore the same regimental colors as their units, but they also had fringed and embroidered epaulets, gilded buttons and colored silk sashes; the decorative excesses stipulated for earlier officer uniforms were prohibited by 1841. Generals, however, were allowed such field dress fineries as gold epaulets with heavy bullion fringes, intricate gold and silver collar embroidery and jeweled medals.

Uniform accouterments for the regular infantryman included: a hide or canvas knapsack that held spare clothes, rations, musket flints and the like; a strapped burlap blanket; a crossbelt supporting a 40-round tin cartridge box and scabbard bayonet; and a canteen of either wooden drum or tin style. Gourds were also used as nonregulation canteens in both Mexican and American armies. A cavalryman was issued a belted saddle roll, bandoleer, pistol holsters, cartridge box, canteen, riding gauntlets, and various horse furniture, including a canvas sack with horse grooming accessories.

The above uniforms and accouterments generally were supplied to relatively small, elite corps as they were difficult to supply the entire armed forces. The complaints of General Ciriano Vázquez from Jalapa, written in 1842, were typical of the Mexican Army during the war with the United States which began four years later:

> The greater part of the rank-and-file of the 2nd Active Battalion, 7th Regiment, are short of overcoats, blankets or any heavier garment that could serve them as cover on rainy and cold nights or when asleep in their quarters, it being necessary for them to go to sleep dressed, with the result that the only uniform issue they possess is quickly destroyed. To avoid this damage and provide them with an indispensable item that will make their service more bearable...have the kindness to inform His Excellency the President about the great necessity of providing them at least with one coarse frieze blanket each.

Three months later, Vázquez received one canvas uniform per man. This consisted of: a shirt, jacket, stock, trousers and barracks cap. However, he was told it was impossible to obtain the regulation one wool and two canvas uniform sets per soldier (Katcher 1976:23).

The average Mexican enlisted man was an Indian of small build with a height averaging 5 ft 2 in (Hefter et al. 1958:52), who was forcibly impressed into the Mexican Army for a 10 year service. Often the Indian recruit spoke no Spanish and his entire service time usually was spent in an alien region far from home. The ranks also numbered conscripts taken en masse from prisons as well as unmarried men without influence. Some were unlucky enough to have been caught in one of the yearly dragnets while in dance halls, streets and other public places. The desertion rate was understandably heavy. Those who were of mestizo heritage and of proven competence conceivably could become noncommissioned officers, and even reach officer rank (Hefter et al. 1958:60). At Palo Alto, the Mexican army was made up of line regiments, sapper battalions, guard units, presidial companies and auxiliaries; all came from various Mexican states reflecting the diverse cultures, language groups and split loyalties found within nineteenth century Mexico (Hefter et al. 1958:63).

Infantry regulations detailed a variety of relatively complex tactical maneuvers performed to perfection by elite, veteran units. Less was expected from the trooper in the line regiments, who just was drilled to march in simple column formation and dress ranks on the firing line (Thompson 1846:173). Musket drill was a simplified version of contemporary European armies (Hefter et al. 1958:Plate XI; Haythornthwaite 1979:18), and live-round musketry practice was virtually nonexistent. It was once observed that a Mexican soldier's first experience at firing a musket was at his first battle (Thompson 1846:173).

The infantryman had to overload his musket to compensate for the bad gunpowder. To protect himself from the resulting heavy recoil he fired from the hip, thus causing the musket ball to fly on a high trajectory, well over the heads of the enemy ranks (Smith 1919:10). In light of this, it is not surprising Mexican generals placed their faith in the bayonet charge. Despite their poor training, obsolete weaponry and virtually nonexistent logistical support, the Mexican soldier possessed stamina and undeniable bravery. The battle at Palo Alto both tested and amply demonstrated these virtues.

Tactics

Strategy is that aspect of military science dealing with the planning and directing of projects and campaigns. It involves the mass handling and movement of troops, artillery and equipage for waging war within a theater of operations. Tactics, "the armored fist of strategy", represents the means by which the field commander on the battlefield achieves the goals of the strategy planners. The attack or defense, the maneuvering of soldiers in an advance or withdrawal, patrolling and skirmishing, the commitment of additional troops, are all tactical elements (Darling 1981:9-10).

Mexican and American armies were essentially governed by the **linear formation**, a tactic used as an integral aspect of European-style warfare since the late seventeenth century. Using this tactic, troops marched to the place of battle in **columns** consisting of two or more **files** of men, a maneuver best suited for mobility. Upon reaching the battlefield, troops then maneuvered into a somewhat rigid line formation in ranks three or four men deep. This enabled most, if not all, of a battalion's muskets to fire simultaneously. Innovative modifications to line formation tactics occurred during the Napoleonic Wars; many European countries adopted them as standard practice for their armies. Early nineteenth century line formation tactics developed by victorious England were largely adopted by the United States and Spain and, later, by the Republic of Mexico. Unless otherwise noted, the following information comes from Haythornthwaite (1990:97-102):

Line Formation

Although British regulations strongly recommended the use of a third rank, by around 1800 the use of a two-rank line was almost universal. By forming the line in two ranks, the frontage and resulting firepower of a battalion increased by one-third. However, this also resulted in shrinkage in firepower when gaps caused by casualties were closed by men moving in towards the center of the line. As a result, spaces could appear between battalions or even between companies of a battalion which, if they became too great, could cause a weakness in the battle line.

British tactics required delivery of musket fire in several ways: either a massed volley by the entire battalion (not popular as the line would be undefended until all had reloaded); by ranks, in which case one rank would be loaded at all times; or by subdivision, either company or platoons, so that musketry would be issuing from some part of the line at all times. This sometimes was termed a "rolling volley", as alternate companies or platoons fired in succession from one end of the line to the other.

Loading and firing was done in precision by word of command. With bayonets fixed, the attacking force advanced with some form of musical assistance--fifes, drums and bugles in a U.S. army, large regimental brass bands "beside a horde of trumpeters and buglers" (Deas 1870:103) in a Mexican army. If necessary, noncommissioned officers kept the alignment of ranks straight or evenly spaced. Due to the inaccuracy of the smoothbore musket, the attackers were relatively casualty free until they reached a point 80-100 yd from their objective. The Revolutionary War officer who reportedly exhorted his men, "Don't fire until you see the whites of his eyes," was not making a statement for posterity but giving a necessary order.

> Now came the first crucial test of the foot soldier: the ability to hold his fire for the next fifteen seconds or so needed to negotiate the advance to a point fifty yards or less from the enemy. Here at point-blank range, the order to fire was given. Then, as one synchronized machine and without breaking stride, the men reloaded and delivered a second volley, and if the distance allowed, a third. At the moment of impact, as it closed in upon its opponent, the attacking force turned to the bayonet (Darling 1981:11).

Flanks of the outermost ends of a line were most vulnerable against an attack delivered at right-angles to the line. As a result, Great Britain, as well as the United States, Spain and Mexico, adopted three basic formations to secure the flanks: a company at the extreme end of the line could be "refused", that is, remaining in line but thrown back at an angle to cover the flank; a company could be deployed in column on the flank; or, in the case of a long battle line, an entire battalion could be arrayed in column-ready formation to form a square in the event of a threat by cavalry. In this kind of warfare, rate of fire became more valuable than accuracy. Speed and precision had to be combined with discipline, needed factors for the soldiers to continue loading and firing "...among the heaped-up bodies of their motionless or writhing comrades" (Montrose 1960:336).

Column Formation

As required by British tacticians, an army arrived on the battlefield in groups of battalions (during this period one battalion consisted of approximately 400-600 men) in march formation, then formed into line of battle or columns of attack. There was a difference in formation between a column in march and a column of attack: a column in march had a frontage of perhaps six or eight men and an immense length; in attack, a column had a frontage usually greater in length than depth. Although mobile, the only muskets a column in attack could use were those of the first two or three ranks of the leading company. With so few muskets effective at the head of a column, the attacking battalion obviously was at a disadvantage against a line formation that could bring all its muskets to bear simultaneously. Thus, if the defending line remained steady and unshaken, its concentrated musketry directed against the head of the attacking column virtually could destroy the leading ranks of the latter. Also, since its depth and mass was greater than the ranks in line formation, an attack column was especially vulnerable to artillery fire.

Skirmishers

A skirmish line of men, preferably armed with rifles, deployed in front of the main body to protect the initial column deployment. They delivered their fire not in volley but "at will" and aimed at specific targets, such as officers and artillerymen. This type of fire could cause disorder in the ranks of the enemy line, which was largely powerless to reply. Musketry delivered in volley at skirmishers would cause few casualties since the targets were not in line formation, and artillery fire was less effective against skirmishers because they were not tightly packed as a line or column. Another function of skirmishers was to screen the advance of attack columns behind them. If correctly done, the attack columns would burst upon the enemy line with a degree of surprise, especially if delivered with the rapid pace that columnar formation allowed. The bayonet, a shock instrument, was expected to carry the assault at the final moment of the attack (Preston 1956:192-193).

Square Formation

Infantry in line were extremely vulnerable to an aggressive cavalry charge. If cavalry could catch a unit in line, especially from a flank, a massacre could ensue as the line was "rolled up" and trampled beneath the charge. The "square formation" was the solution to the cavalry threat. This formation allowed companies of the line to fold back upon those in the center to produce a square, or more commonly a rectangular, formation. Each side faced outward to present an almost impenetrable hedge of bayonets against which cavalry was powerless. The weakness of the square was its vulnerability to artillery fire, enforcing the dictum that cavalry attacks ideally should be accompanied by horse artillery. Otherwise, a square was almost invulnerable. The only cavalry capable of inflicting much harm were lancers who, if they survived the square's musketry, could reach over the hedge of bayonets and poke at the infantry with their lances. Very few examples of cavalry breaking square exist, and then only if the infantry were demoralized.

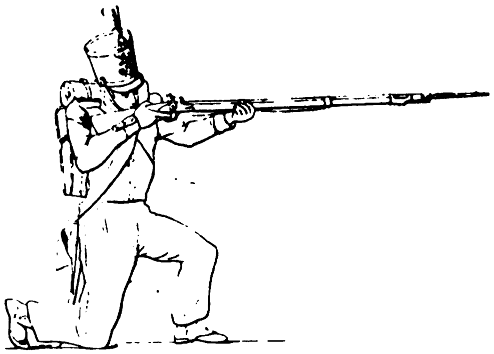
How effective was the musket, not only as a weapon but as a determining force on the battlefield of linear tactics? Colonel George Hanger, a British officer during the Napoleonic Wars, had this to say about the regulation firearm of this period:

> A soldier's musket, if not exceedingly ill-bored (as many of them are), will strike the figure of a man at eighty yards; it may even at 100; but a soldier must be unfortunate indeed who shall be wounded by a common musket at 150 yards, provided his antagonist aims at him; and as to firing at a man at 200 yards with a common musket, you may just as well fire at the moon and have the same hopes of hitting your object. I do maintain and will prove, whenever called on, that no man was ever killed at 200 yards by a common soldier's musket, by the person who aimed at him (Lord 1989:39).

In 1804, Robert Jackson, an inspector-general of British Army hospitals, made a report regarding volley firing:

> Such explosions may intimidate by their noise: it is mere chance if they destroy by their impression...History furnishes proof that the battle is rarely gained by the scientific use of the musket: noise intimidates; platoon firing strikes only at random; the charge with the bayonet decides the question...(Fuller 1925:97).

Of course, at Palo Alto, neither army employed the culminating bayonet charge demanded by linear tactics. Instead, the Americans simply battered their opponents from a safe distance with their artillery, and most of the Mexican infantrymen never came within 400 yd of their enemy counterparts. Until this battle, artillery was a branch of weaponry limited to a largely defensive role on European and New World period battlefields. Linear tactics were practical only as long as the primary weapon was the smoothbore musket. This tactic became outmoded after the acceptance of the rifle as the standard infantry arm.



CHAPTER FIVE

DOCUMENTARY ANALYSES

A simple 1:1 overlay of period battle maps of Palo Alto onto USGS topographic maps and aerial photographs does not provide a reliable reconstruction of the battle lines. The standards and scaling of period maps were not at all accurate as compared with USGS quadrangle maps of today, nor were period maps expected to be that accurate. This situation prevents precise correlation of Palo Alto battle maps with modern maps of the battlefield. Reasonably accurate battle interpretation requires synthesis of selected and weighted information obtained from various historical maps and battle accounts. Only then can such data be correlated in conjunction with topographic maps, aerial photographs and artifact distributions.

Historic maps and eyewitness accounts of the battle are subjective constructs of their authors, whose observations possibly were influenced by nationalistic biases or faulty powers of observation. Some eyewitness accounts of the battle of Palo Alto disagree on specifics, perhaps due to confused memories when written many years later. Recorded observations of battle events might conflict due to various fields of vision, the latter probably obscured, at times, by the literal "smoke of battle". Soldiers often recollect a battle as "a half-remembered blur, a mosaic somehow fragmented and haphazardly reassembled" (Keegan and Holmes 1986:263).

Mexican-American War historian Justin Smith noted a large number of both intentional and accidental misrepresentations existed in official military documents of the war:

> It was legitimate for a general, bearing in mind that probably his statements would soon become known, to consider their effect on the officers concerned, the army in general, the government, the public at home, the enemy, and the world at large...To gain these ends more or less misrepresentation was needed...General Taylor received great credit for his reports, but they were written, in fact, by the assistant adjutant-general of his army, W.W.S. Bliss, who was a finished artist in discreetly [sic] omitting and sagaciously emphasizing. Bliss never lied and never told the truth, one may almost say (Smith 1915:96-97).

Yet objective battlefield data, such as aerial photographs, topographic maps and archeological evidence, have their interpretive limitations as well. As noted in Chapter Two, various alterations in topographic and vegetative configurations have occurred at Palo Alto. Some alterations are obviously manmade, or are known as such through informants, others are the result of natural erosion and deposition that have been ongoing since the battle. Thus, one cannot presume every natural feature described at the time of battle has the same configuration today or, for that matter, still exists. For example, one could mistakenly assign historical significance to a present-day marshy area not in existence at the time of battle. Furthermore, the "true" marshy area may have long since dried up or filled in without leaving any visual trace.

Assigning artifact concentrations to a specific battle event, such as a historically documented Mexican flanking maneuver, has its interpretive hazard as well. Battlefield plundering by relic collectors has compromised pattern interpretation to an unknown degree since artifacts have been both selectively and intensively removed from accessible areas. Possibly a seeming artifact cluster, demarcated by an area bare of artifacts, owes its anomalous existence not to a specific battle event but rather to a protective vegetation covering (protective, that is, until the archeologist removed it), the bare area surrounding this patch of thick vegetation cover long since stripped of its artifacts.

Greater weight attends to battlefield data that holds up best under the following four criteria:

Closeness. Sources of information from actual observers and participants of the battle. Fortunately, there are a number of such sources. There also are sources who provide hearsay accounts, or accounts recorded many years after the battle took place.

Competence. Of the above sources, those most capable of understanding and describing the battle. The best detailed descriptions of battle events were done by educated individuals, making exacting reports of their observations.

Mutual Support. Eyewitness sources that give congruent descriptions of specific battle events and topographic features that strongly support their validity. This is especially true if the sources were opponents since there is much less chance of one such informant influencing the other.

Impartiality. The sources with the least to gain from distortion of battle events, for example, a soldier whose career would not be enhanced or jeopardized by providing a true account of what he observed. In a sense, this criterium also includes archeological data. Such data provides artifact patterns that are a dispassionate record of battle events; the interpretor of that record is the one who may lack impartiality.

Thus, the ideal sources of evidence would be highly competent and impartial observers whose written observations are mutually supportive. Realizing such sources for Palo Alto research is, unfortunately, comparable to Diogenes' search for the Honest Man.

Historic Maps

Historical interpretations of Palo Alto greatly depend on period maps illustrating military units placement and their various tactical maneuvers. Of equal importance are the topographic data such documents provide. Unfortunately, for whatever reason, U.S. Topographic Engineers on Taylor's staff did not prepare official battle maps of Palo Alto and Resaca de la Palma as they did for all of the rest of the major battles south of the Rio Grande. Several contemporary U.S. battle maps of Palo Alto were produced by unknown or obscure individuals, for example, the unsigned Palo Alto map by Henry (1847:92) and Stewart (1887), who may well have used superannuated, nonauthoritative battle accounts to produce the maps.

A somewhat different problem exists vis-a-vis the battle map of Palo Alto prepared by an officer of the Mexican army. In this instance, two semi-official battle map sketches (Figures 26 and 27) were produced by General Mejía's adjutant, Captain Jean Louis Berlandier. Berlandier, a noted nineteenth century French geographer, produced writings, drawings and maps of northern Mexico that have been of great use to later scholars; he meets both criteria of closeness to the event and educated competence. However, as discussed below, the Berlandier sketches are not without their own peculiar problems.

The Berlandier Sketches

Primary research conducted by NPS historians resulted in the discovery of Berlandier's two sketch plans of the battle, drawn shortly after the battle took place. Presumably Figure 26 is Berlandier's first sketch attempt since its page number is 55; the second sketch, Figure 27, is paginated 78.

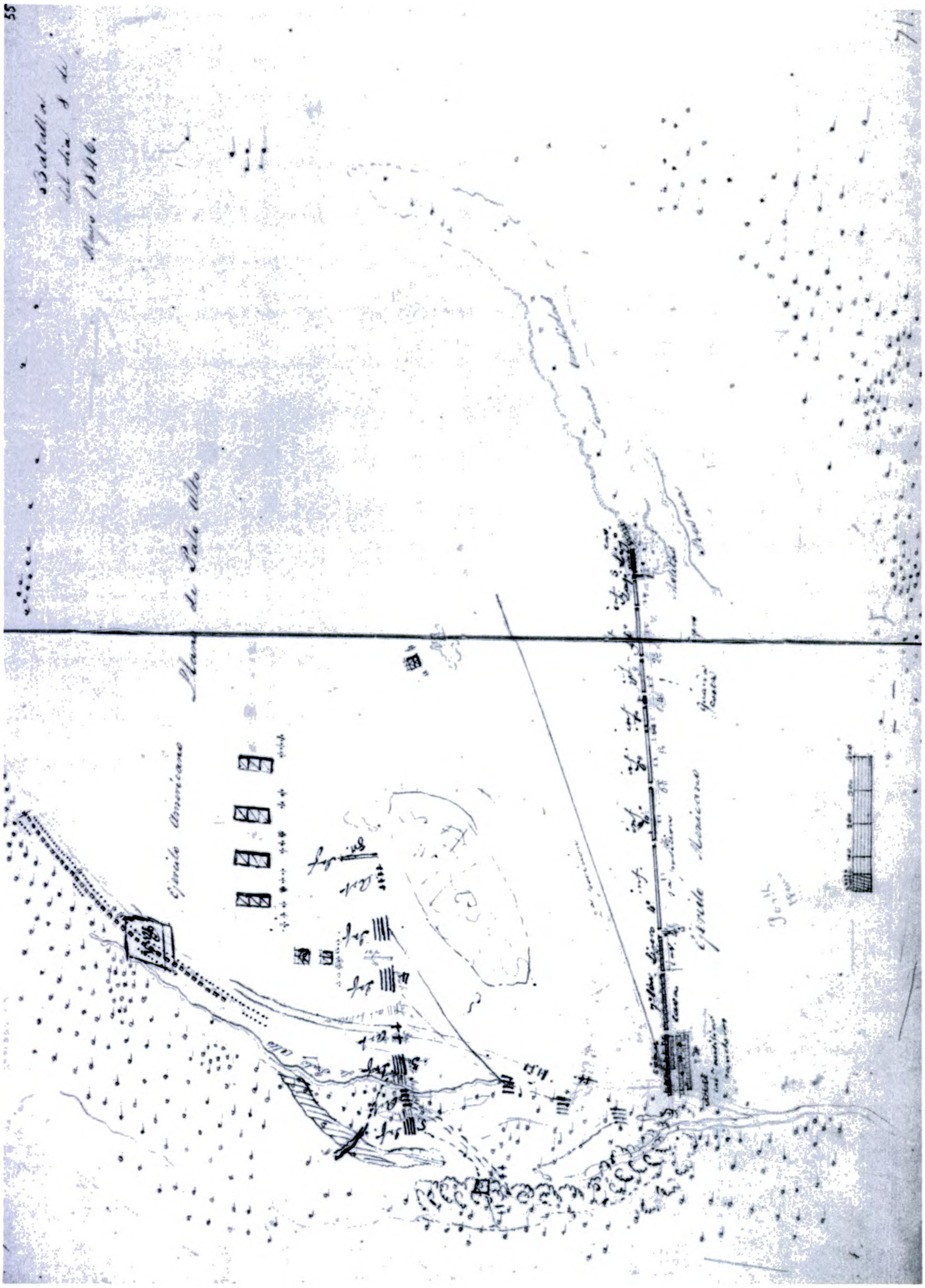

Batalla del dia 8 de Mayo 1846.
Plano de Palo Alto
Ejercito Americano
Ejercito Mexicano

Figure 26. Berlandier's first sketch of the battle.

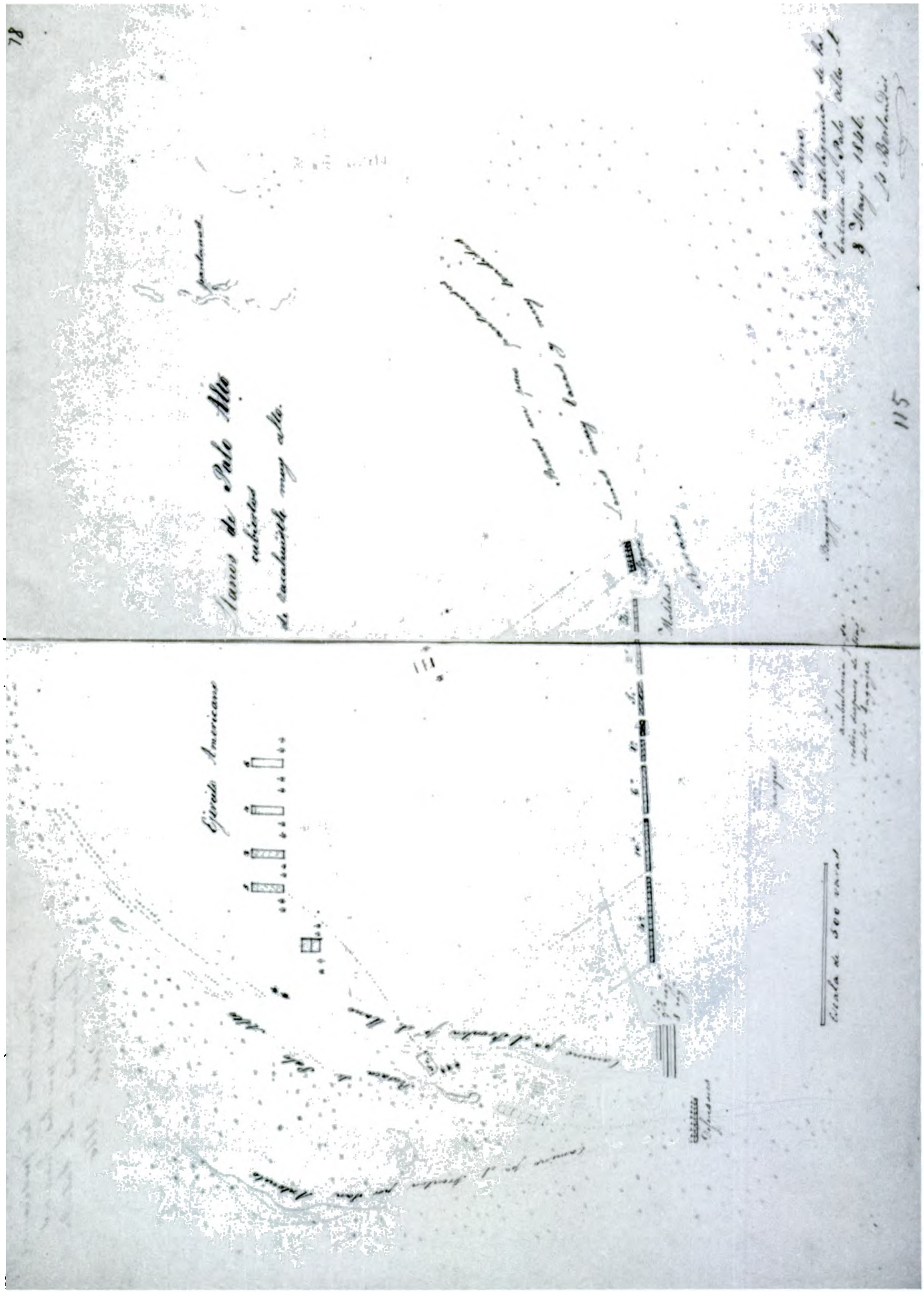

78
Llanos de Palo Alto
cubiertos
de zacahuistle muy alto
Ejercito Americano
Escala de 500 varas
Plano
p.a la inteligencia de la
batalla de Palo Alto el
8 Mayo 1846
J. Berlandier
115

Figure 27. Berlandier's second sketch of the battle.

Essential battle data noted on both sketches include: 1) the initial position of the Mexican army between the Matamoros Road and the western terminus of the low rises to the east; 2) orders of battle for both armies during both phases of the battle; 3) the various maneuvers of both armies; 4) approximate spacing between the two opposing armies; 5) location of the road to Matamoros; and 6) the general locations of resacas, ponds, low rises and mesquite thickets.

Berlandier noted on his first sketch the presence of two or three marshy areas, centered more or less between the two opposing forces. He apparently then decided to group them together on the sketch as simply one large marsh. In addition to this marsh he delineated another, smaller marshy area, located directly in front of his placement of Captain Duncan's battery during the final phase of battle. Both of these marshes are present on the second sketch, but their delineations are faint, as if they had been erased.

The earliest known published battle map of Palo Alto appeared in *Compaña Contra los Americanos, Mayo de 1846* (Anon. 1846b:10) (Figure 28), published a few months after the battle. Hereafter, this battle map is referred to as "Map A". Berlandier was the author of Map A, his sketches unboubtedly used to provide the information described on this map. Map A was a significant source of information for several historians who wrote about the battle. For example, it was republished in *The Other Side: Notes for the History of the War Between Mexico and the United States* (Alcaraz et al. 1848), a Mexican account of the then recently concluded hostilities. The U.S. translation of this book (Ramsey 1850) (Figure 29) also used Map A; and an 1887 map of the battle, by a J.W. Stewart, an unidentified cartographer, used Map A. Stewart, however, made a significant revision of Mexican troop movements during the second phase of battle (Figure 30). Hereafter, Stewart's edited version, combining elements of Map A and Ramsey's map, is referred to as "Map D".

Unlike Berlandier's first sketch showing one large marsh between the two armies, Ramsey's map shows five marshy bodies widely scattered between the two armies. These marshy areas are described as "low bottoms" on the map legend. Also, Mexican troop movements noted on Map A show these low bottoms hindered the advance of the Mexican right flank during the final phase of battle. Apparently, a marshy obstruction of some tactical significance existed between the two armies. This obstruction was perhaps one reason why significant troop movements at Palo Alto occurred only on the flanks. Any major assault toward the center of the opposing army might have literally bogged down, inviting destruction of the stalled attackers.

Map A and Berlandier's sketches show the relatively high ground that demarcated the southern and eastern boundaries of the battlefield. The second sketch presents the most detailed information regarding the high ground, described as "*lomas muy baxas y muy tendidas*" ("hills that are very low and very spread out"). This formation probably was the low levee still bordering the present-day resaca located in this area of the battlefield (Area G, Figure 3). Fronting the northern sides of this probable levee were "*baños un poco pantandos*" ("a few stagnant ponds").

Berlandier also identified a resaca at the southern end of the dune series, as well as *motitas* ("low rises"), situated directly behind the extreme right flank of the Mexican army. Berlandier's sketches and Map A show thick vegetation cover south of the Mexican position, and the approximate locations of the Mexican field hospital and wagon park.

Curiously, on his second sketch (Figure 27), Berlandier lightly drew in a large detachment of Mexican cavalry and light infantry at the northern end of the above-described dunal formation--almost a mile away from the Mexican right flank. Neither his first sketch nor Map A illustrated such a phantom and forlorn detachment, which raises some doubt as to its actual placement, or possibly even

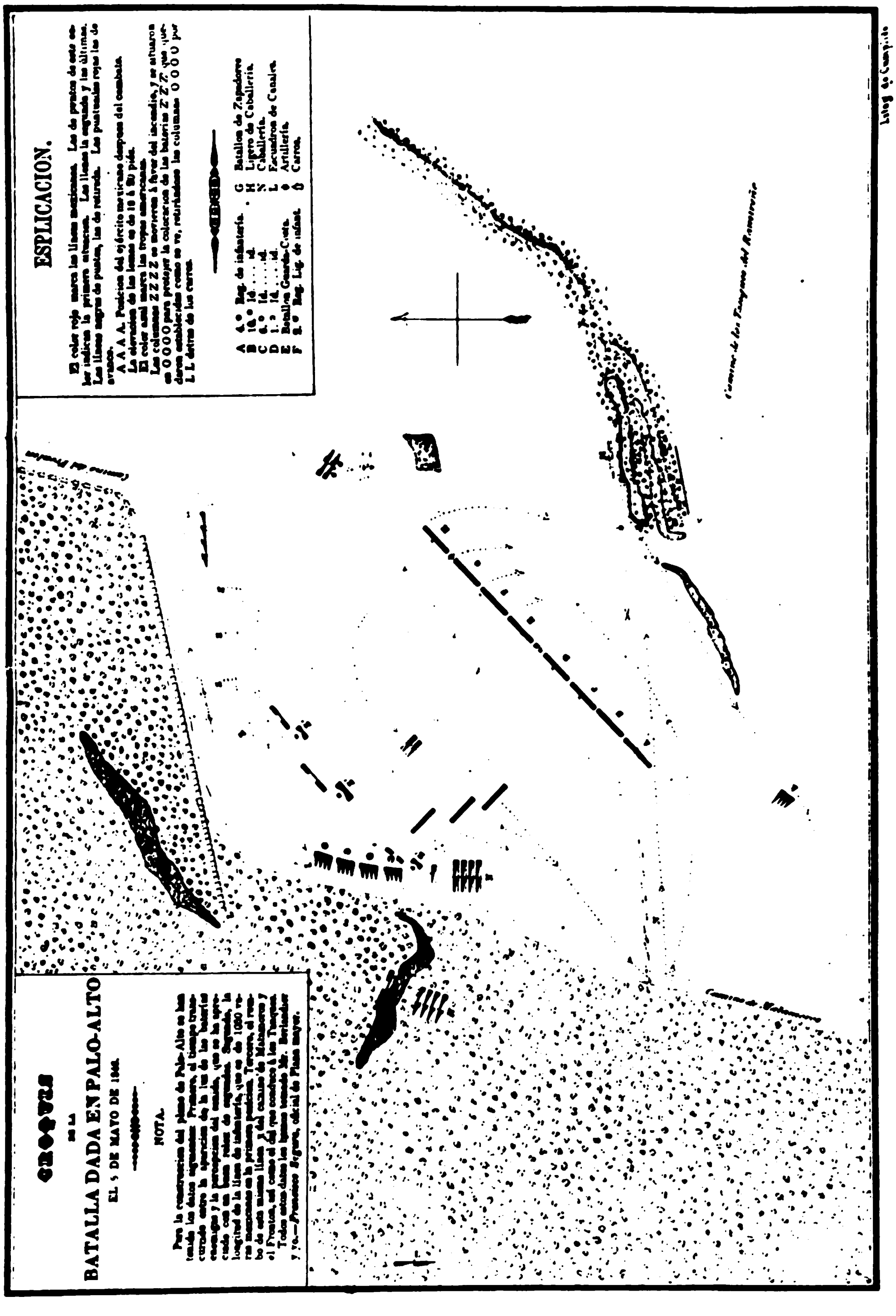

CROQUIS
DE LA
BATALLA DADA EN PALO-ALTO
EL 8 DE MAYO DE 1846
NOTA.
ESPLICACION.

Figure 28. Mexican battle map (Map A) (1846).

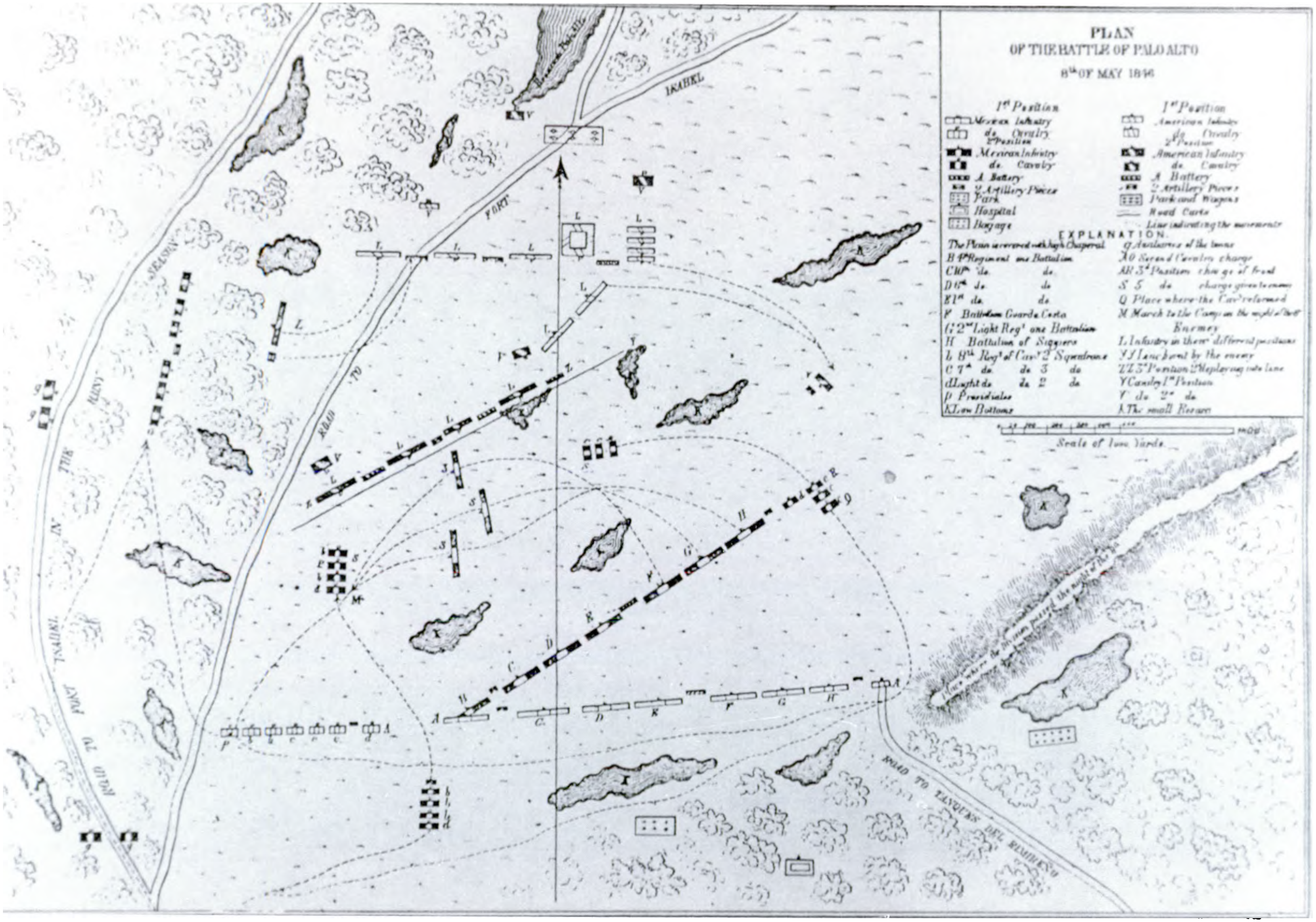

PLAN
OF THE BATTLE OF PALO ALTO
8th OF MAY 1846
1st Position
Mexican Infantry
do Cavalry
2d Position
Mexican Infantry
do Cavalry
A Battery
2 Artillery Pieces
Park
Hospital
Baggage
1st Position
American Infantry
do Cavalry
2d Position
American Infantry
do Cavalry
A Battery
2 Artillery Pieces
Park and Wagons
Road Carts
Line indicating the movements
EXPLANATION
The Plain is covered with high Chaparral
B 4th Regiment one Battalion
C 10th do do
D 6th do do
E 1st do do
F Battalion Guarda Costa
G 2nd Light Regt one Battalion
H Battalion of Sappers
I 8th Regt of Cav 2 Squadrons
C 7th do do 3 do
d Light do do 2 do
p Presidiales
K Low Bottoms
Second Cavalry charge
Q Place where the Cav reformed
M March to the Camp on the night of the
Enemy
L Infantry in their different positions
Y Cavalry 1st Position
V do 2d do
Scale of 1000 Yards
ROAD TO FORT ISABEL
ROAD TO TANQUES DEL RAMIRENO
ROAD TO FORT ISABEL IN THE RAINY SEASON

Figure 29. Ramsey's map (1850).

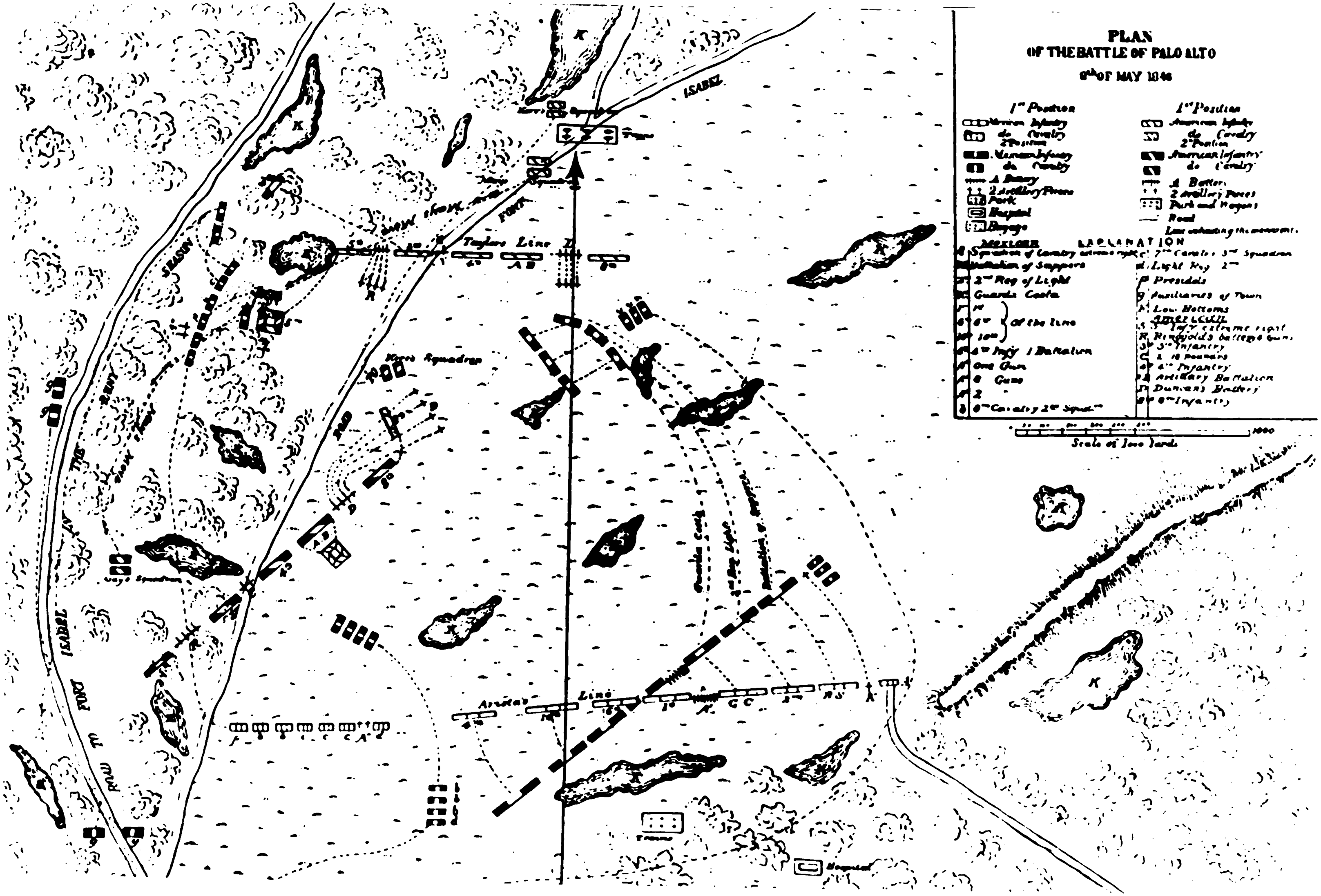

PLAN
OF THE BATTLE OF PALO ALTO
8th OF MAY 1846
1st Position
Mexican Infantry
do Cavalry
2d Position
Mexican Infantry
do Cavalry
A Battery
2 Artillery Pieces
Park
Hospital
Baggage
1st Position
American Infantry
do Cavalry
2d Position
American Infantry
do Cavalry
A Battery
2 Artillery Pieces
Park and Wagons
Road
Line indicating the movement.
MEXICAN
EXPLANATION
Squadron of Cavalry extreme right
Battalion of Sappers
2d Reg of Light
Guarda Costa
1st
6th
10th
Of the line
4th Inf. 1 Battalion
One Gun
8 Guns
2
8th Cavalry 2d Squad.
7th Cavalry 3d Squadron
Light Reg 2d
Presidials
Auxiliaries of Town
Low Bottoms
AMERICAN
5th Infy extreme right
Ringgolds battery guns
3d Infantry
2 18 pounders
4th Infantry
Artillery Battalion
Duncans Battery
8th Infantry
1000
Scale of 1000 Yards
ISABEL
FORT
Taylors Line
Arista's Line
Hospital
ROAD TO FORT ISABEL

Figure 30. Stewart's map (Map D) (1887).

its existence, on the battlefield. Yet this isolated Mexican detachment also appears on Captain Henry's map of Palo Alto, that is, "Map B" (Figure 31), discussed below.

On his first sketch Berlandier detailed the battle positions held by the various U.S. battalions and batteries toward the end of the day (Figure 26). Yet Map A illustrates these U.S. positions in a different battle line configuration. Noteworthy is that Berlandier's first sketch best approximates what American officer Lieutenant Scarritt observed and sketched for the final phase of the U.S. battle line.

Taken as a whole, Berlandier's two sketches, Map A and Ramsey's version of Map A portray a Mexican army that: 1) adopted an initial defense strategy not especially innovative in concept but appropriate in basic principles for line battle tactics, that is, anchoring both flanks on topographic obstacles to discourage enemy outflanking attempts, and cavalry units stationed on the flanks; 2) conducted several aggressive cavalry and light infantry attacks on both flanks of the enemy, including a final, 35° counterclockwise swing northwestward of the entire Mexican line; and 3) held at bay the U.S. army, the latter shown as never coming to within about 150 yd of the Mexican left flank. If this were true it means the Mexican army did not retreat from their strategic position on the Matamoros Road.

The American Maps

The three following published battle maps conflict with certain details on Berlandier's sketches: the map presented by Captain W.S. Henry in his *Campaign Sketches of the War With Mexico*, published in 1847 (Map B, Figure 31); and the battle map (Map C, Figure 32) drawn by Lieutenant S.D. Dobbins of the Third Infantry and published in a pamphlet a few months after the battle of Palo Alto (Anon. 1846a). This map also was reproduced with minor changes in Brooks (1965 [1849]:126), and by J.W. Stewart in 1887 (Map D, Figure 29) and in Wilcox (1892:52).

Captain Henry was not at the battle of Palo Alto but joined Taylor's command some months later. In his book, Henry stated he depended on official dispatches and personal written accounts to describe events at which he was not present, for example, the battle of Palo Alto (Henry 1847:v). Lieutenant Dobbins was an officer with the Third Infantry, the regiment at Palo Alto that moved to the American right (west) flank in defense of the wagon train. From this position Dobbins probably would not have been an actual observer of the battle activities east of the Matamoros Road. Thus, to produce his map, Dobbins would have had to obtain much of his information from official documents and other knowledgeable battle participants. Stewart's 1887 Map D was acquired from the Brownsville Historical Association as a nonreferenced document; since it appears in Wilcox (1892), Map D may have been created specifically for that book.

Instead of a Mexican advance pivoting on their Fourth Line regiment, both Maps B and C show a retreat of the Mexican left flank while only their right flank advanced. These American maps, however, show the Mexican center as their pivot point during the second phase of battle. Also, Maps B and C show the final Mexican battle line as extending along an almost north-south axis, which represents more than a 75° shift from its original position. In contrast, both Berlandier's sketches and Map A show a Mexican line shift in a counterclockwise direction of about 35°. Maps B and C also portray the retreat of the Mexican left flank as an abandonment of their initial position on the Matamoros Road; this is a significant contradiction to Map A, Ramsey's map and Berlandier's sketches.

Maps B and C, unlike the Mexican map and sketch versions, identify the presence of Mexican reserves behind a belt of thick vegetation, presumably the higher ground illustrated on both of Berlandier's sketches and on Map A, and provide greater detail on the various positions taken by the American light field pieces. Interestingly, Map B shows the Mexican irregular or "ranchero" cavalry

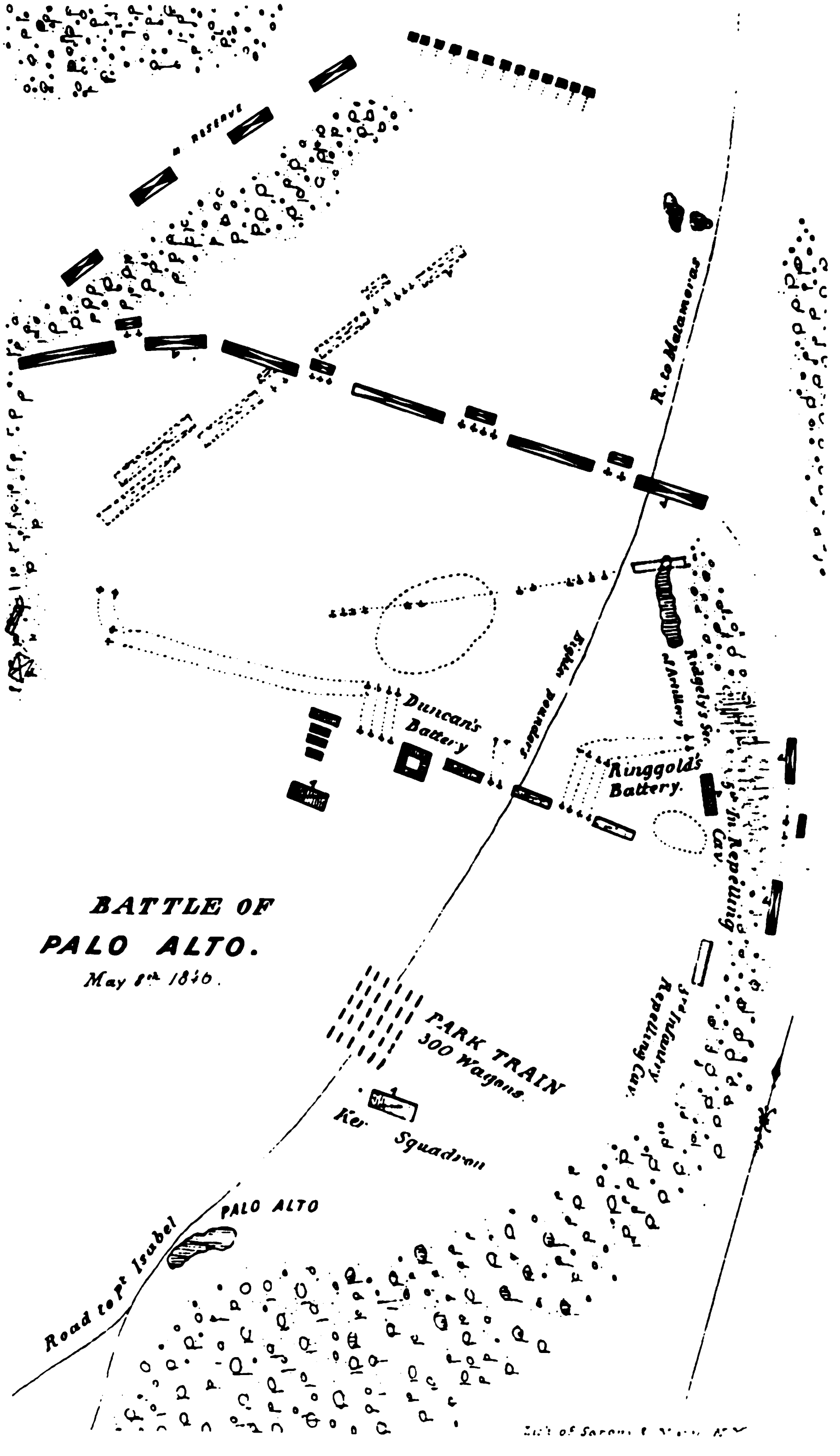

BATTLE OF
PALO ALTO.
May 8th 1846.
reserve
R. to Matamoras
Eighteen pounders
Duncan's Battery
Ringgold's Battery.
Ridgely's Sq. of Artillery
5th Inf. Repelling Cav.
3rd Infantry Repelling Cav.
PARK TRAIN
300 Wagons
Ker Squadron
PALO ALTO
Road to Pt Isabel

Figure 31. Henry's map (Map B) (1847).

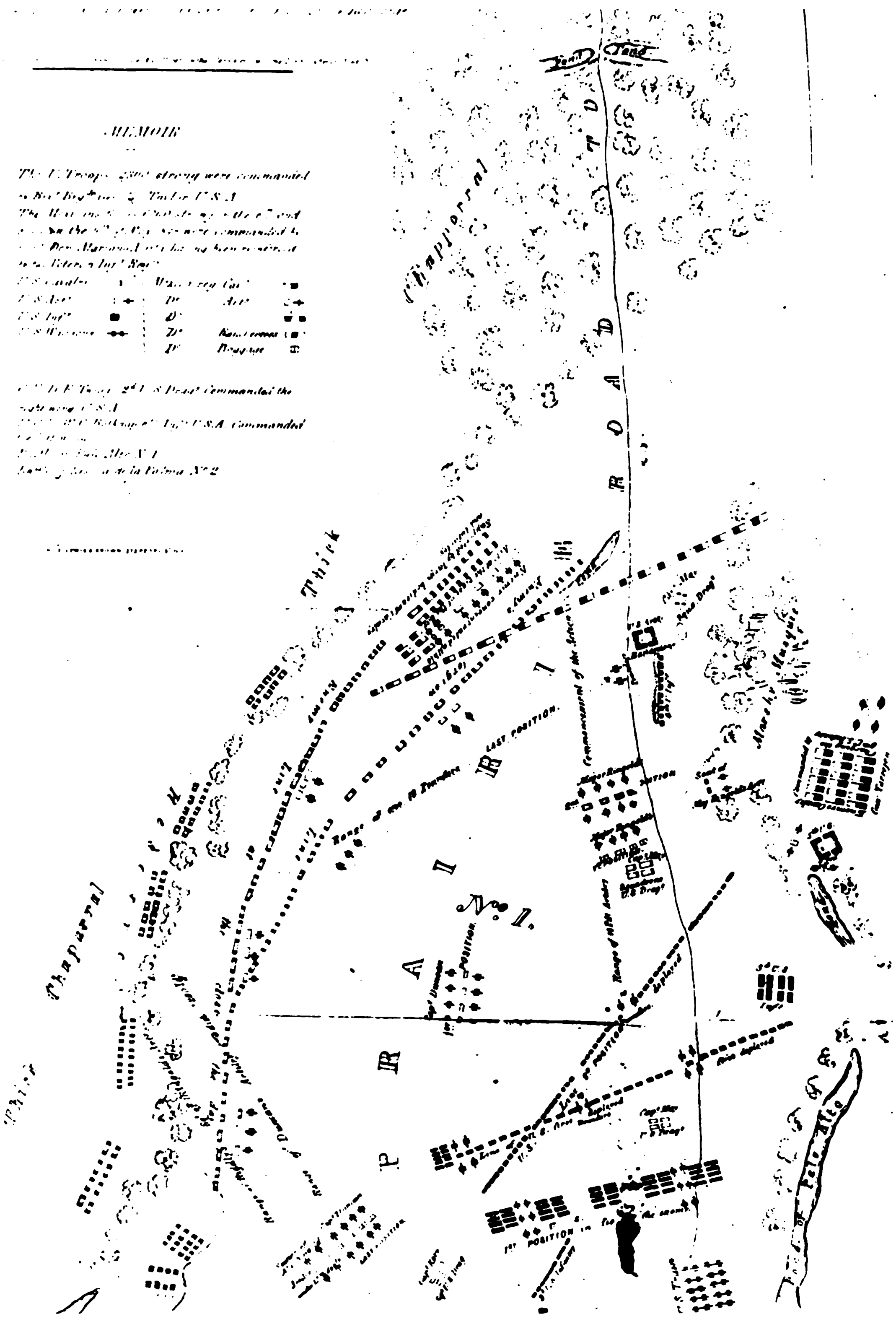

MEMOIR
Tank
ROAD
Chapparal
Thick
Chapparal
PRAIRIE
No. 1.
LAST POSITION
1st POSITION
Palo Alto

Figure 32. Dobbins' map (Map C) (1846).

on the Mexican right flank; in all written accounts, the Mexican irregular mounted unit, led by General Canales, was positioned well to the west of Palo Alto and did not participate in the battle.

Map B identifies a marshy area between the initial battle lines, as do Bandelier's sketches and Map A. However, Map B shows the U.S. second battle line position partially within this marshy area, suggestive that the latter may not have been an especially significant tactical obstacle (Figure 30; note that the orientation for Map B has "South" at the top of the page and no scale).

Map B shows the U.S. supply train approximately equidistant between Palo Alto pond and the initial position of the U.S. army. This map version also shows the train formed in a defensive, compacted formation by the time the battle began. In contrast, Berlandier's sketches and Map A depict the train as an unformed, essentially defenseless string of wagons. Ramsey's map, however, shows the wagons in their post-battle defensive position, that is, just south of Palo Alto pond and in defensive formation.

Map C shows U.S. and Mexican positions in three phases: 1) their initial battle lines; 2) a later counterclockwise shift in linear positions; and 3) a final phase, in which U.S. 18-pounders faced almost due east. During the final phase, the Mexican line is shown extended along an almost north-south axis in front of a belt of chaparral on the eastern limits of the battlefield; presumably, the chaparral corresponds with the "very low hills in a series" noted on Berlandier's sketches and on Ramsey's map. Map C also shows the last location of Duncan's artillery pieces; at this point, the distance of his pieces from the Mexican line is 200 yd.

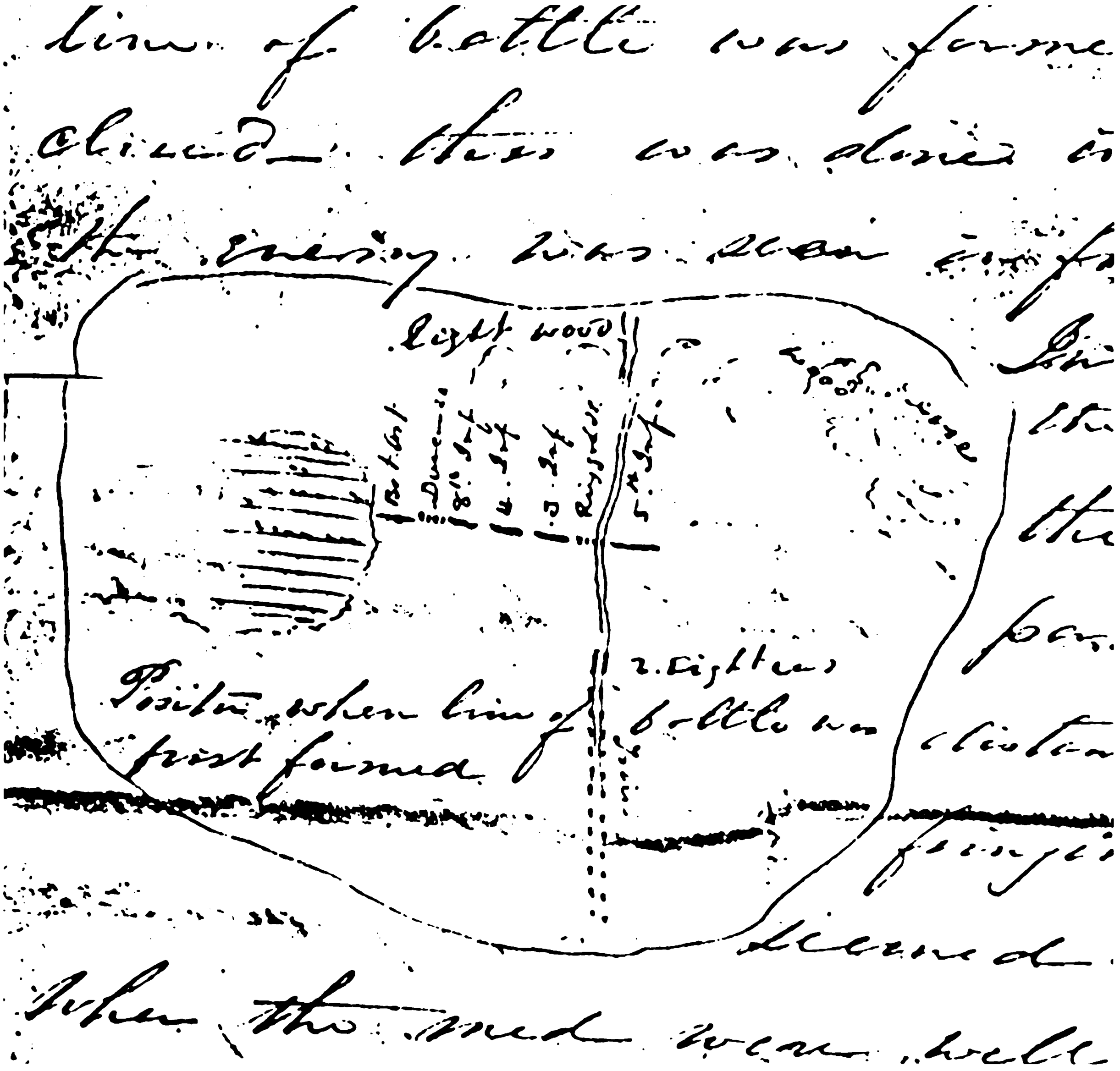
Finally, Stewart's 1887 Map D (Figure 29) shows the retreat of the Mexican army from their defensive position on the road, which is suggestive that Map D was largely based on information gleaned from the earlier Maps B and C.

Lieutenant Scarritt's Sketches

Lieutenant J.M. Scarritt was the officer in charge of the fortified wagon train the day after the battle. Four days later, Scarritt wrote a letter to a Colonel J.G. Totten in which he described the battle (Scarritt 1846). In the margins of his letter Scarritt provided three sketches showing the battle phases and various unit maneuvers conducted by both armies (Figures 33-35); a fourth sketch shows a plan view of the defensive earthworks for the wagon train (Figure 15). None of the sketches include a scale or north arrow. Figure 33 is Scarritt's first sketch, showing the "[U.S.] position when line of battle was first formed" (Scarritt 1846). According to the text of the letter, this line of battle was formed:

> ...when about 15 miles from Point Isabel and one mile this side of the position called Worth's Camp...this was done in consequence of the report of our advance that the enemy was seen in front and appeared to be advancing...The force advanced until it came to the water hole at Gen. Worth's camp...From this position the enemy were distinctly seen distant about two miles...(Scarritt 1846).

Besides labeling the various U.S. units, Scarritt also noted on the first sketch: 1) a broad, marshy area to the immediate left (east) of the Artillery Battalion, the latter positioned on the extreme left flank of the U.S. army; 2) Matamoros road, as well as the wagon train strung out on the road and behind the army; and 3) "light wood" and "wood resace" [sic] to the north and west of the army, respectively.



line of battle was forme
clined. there was done to
the enemy was seen in fr
Gen
the
the
for.
distan
fringe
skirted.
When the road was well

Light wood
Bat Art
Duncan
8th Inf
4 Inf
3 Inf
Ringgold
5th Inf
2 Lights
Positn. when line of battle was first formed

Figure 33. Lieutenant Scarritt's first sketch, initial order of battle of the U.S. army.

Figure 34 is Scarritt's second sketch, which shows both armies' unit positions at commencement of the battle. Although no attendant scale, the text of the letter states the U.S. right flank "came within one half mile of [the Mexican] left". The sketch also shows: 1) the U.S. train had, by then, assumed its defensive formation and position at "Worth's Camp", a clearing between the road and Palo Alto pond that had been occupied by the Mexican army just a few days before the battle; 2) the Mexican battle line extending across the prairie in a broad arc formation, with a total of 10 cannon interspersed between the Mexican units; and 3) the Mexicans' initial flanking attempt, a maneuver thwarted by the U.S. right flank.

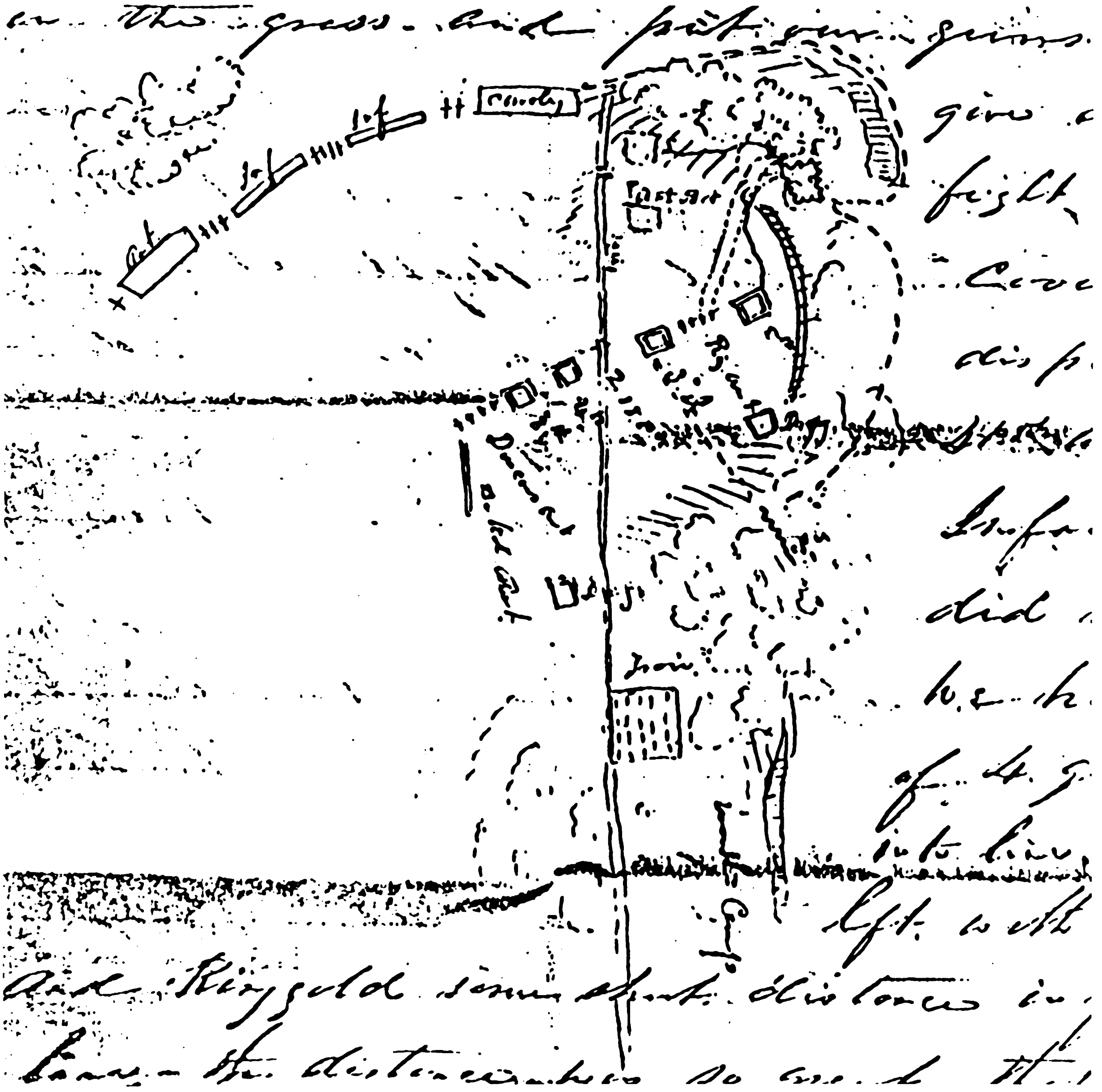


Figure 34. Lieutenant Scarritt's second sketch, first phase of the battle.

Figure 35 is Scarritt's illustration of the final phase of battle. It shows: 1) the right flank of the U.S. army more or less aligned with the road and "advanced... to the place [once] occupied by [the Mexican] left..."; 2) Churchill's 18-pounders and Ringgold's 6-pounders, both batteries aligned perpendicular to the road to face the final Mexican battle line now positioned to their east; and 3) Duncan's battery in its final position to enfilade the oncoming Mexican right flank.

In summary, Scarritt's sketches, Henry's Map B and Dobbins' Map C are in agreement that: 1) the Mexican line extended along an almost north-south axis during the final phase of battle,

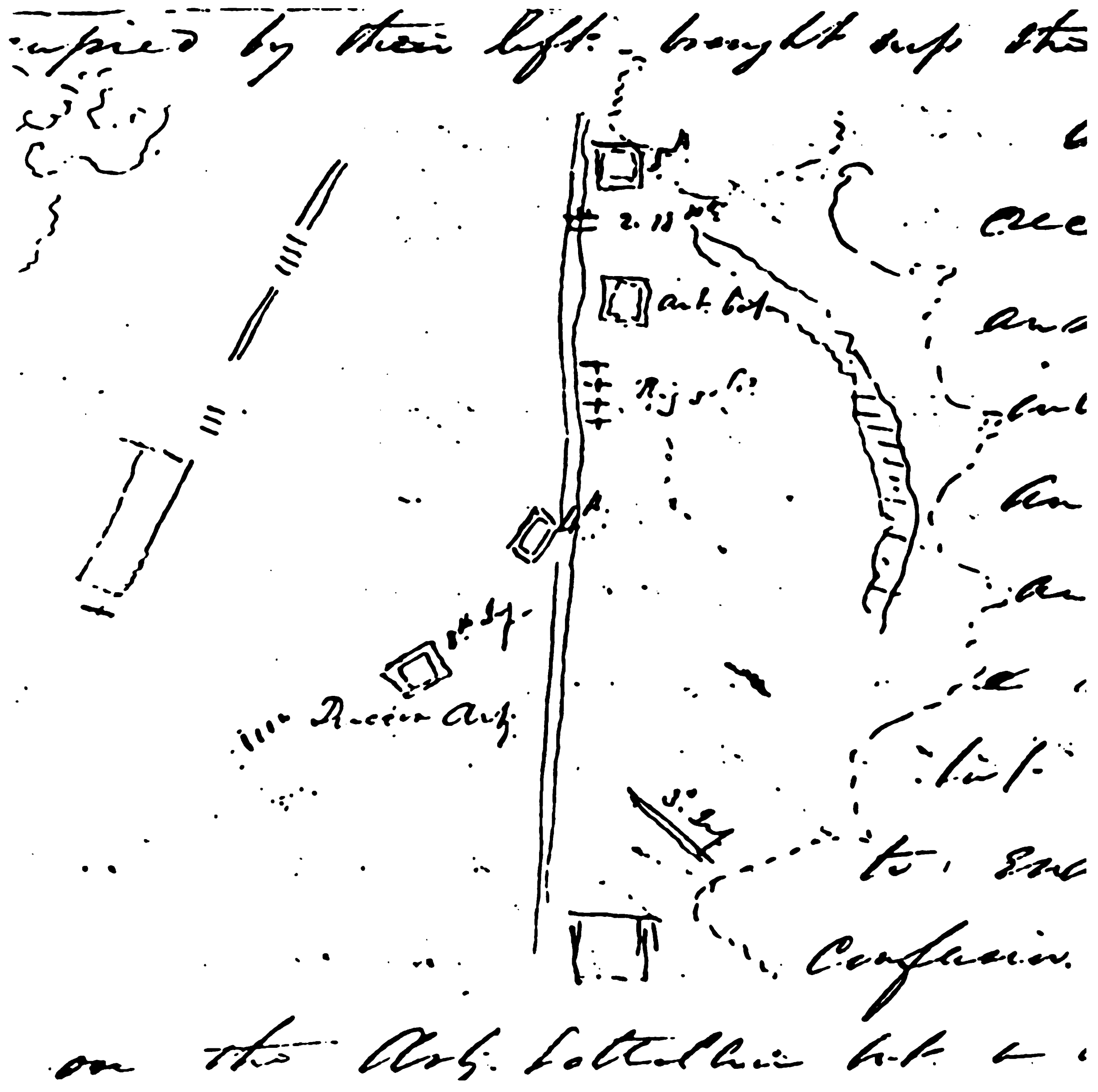


Figure 35. Lieutenant Scarritt's third sketch, final phase of battle.

presumably as a defensive reaction to the final U.S. position situated in part on the original Mexican battle line and in rough alignment with the Matamoros road; and 2) as a result of this new position, the Americans forced back the Mexican left flank. Thus, the illustrations of Scarritt, Henry and Dobbins meet the criterion of mutual support. Stewart's Map D seems to be a hybrid of earlier published maps, representing both Mexican and U.S. versions of the battle.

But what of Berlandier's sketches, Map A and Ramsey's version of Map A? These maps show the Mexicans accomplished an orderly, almost clockwork precision pivot **advance** toward the

Americans, an interpretation sharply at odds with the above-described contemporary U.S. maps and sketches. Yet we consider Berlandier to be part of the select group of competent eyewitnesses; in fact, some of his sketch notations receive mutual support from certain U.S. map versions, such as the marshy area between the battle lines, orders of battle, and various other maneuverings of both armies.

At this juncture, one must consider the possibly overriding criterion of **impartiality**, or lack thereof. Perhaps it was politically wise for Berlandier to illustrate an aggressive Mexican advance of their entire battle line during the final phase of battle instead of a collapse of their right flank, which is what happened. Smith's earlier quoted assertion regarding official U.S. Army equivocations during the war applies to officers of the Mexican Army as well. It is also possible Berlandier's tactical observations were simply the result of an honest mistake; he, too, must have experienced some obfuscation and confusion resulting from the "smoke of battle". One can never ascertain the underlying psychological motives that directed any of the participants, including Berlandier, nor do we desire to impugn the integrity or competence of those who can no longer defend their actions. However, one can evaluate and compare the ultimately subjective qualities of battle maps and eyewitness accounts with aerial photographs, conjoined with the patterned material results of the battle.

Aerial Photographs

Fortunately, Palo Alto battlefield has largely escaped the extensive agricultural alterations occurring throughout the Lower Rio Grande Valley. In addition to artifact protection, such relatively pristine topographic conditions permit identification of several historically described topographic and cultural manifestations on the battlefield. These features include: 1) Palo Alto pond; 2) a segment of the Matamoros-Point Isabel Road where the Mexican left flank bisected it; 3) the resaca that figured prominently on the west side of the battle; 4) the Tanques del Ramireño Road; 5) the low rises or *motitas* anchoring the Mexican right flank; 6) the marshy area between the battle lines; and 7) the approximate location of the *lomas tendidas* or resaca levee noted on Berlandier's sketches. Refer to Figure 3, the battlefield aerial photograph, for the following discussion of these features.

Palo Alto Pond (Area A)

Although presently drained by a stock tank, Palo Alto pond nevertheless is visually prominent on the aerial photograph. Several battlefield accounts note the U.S. army obtained water from this pond, located just west of the wagon road they followed, before their final advance toward the Mexican army (e.g., Taylor 1846; Scarritt 1846). Also, the southeastern portion of the pond was the approximate location of "Worth's Camp", where the U.S. wagon train formed into defensive position. Recognition of Palo Alto pond permits an educated guess regarding the initial battle line location of the U.S. army (Figure 10). Also, various defensive maneuverings of the U.S. Third, Fifth and Eighth Infantry regiments were conducted to the east and west of this pond, for wagon train protection; therefore, approximate locations of these regiments during this phase of battle can be deduced.

Matamoros/Point Isabel Road Segment (Area B)

This feature appears on the aerial photograph as an anomalous linear configuration typical of abandoned roads. A ground check revealed this is an area of disturbance vegetation extending within the park boundary for some .4 mi and averaging around 50 ft wide. Close inspection of the aerial photograph also shows a fork in the now-abandoned road. This probably is the same road fork illustrated on Berlandier's sketches (Figures 26 and 27). If correct, then the cavalry and light infantry units that comprised the left wing of the Mexican army initially were stationed just to the north of the fork and, to their left, "woods and marshes difficult to overcome [by the enemy]" (Berlandier 1846:161), that is, the resaca labeled Area C. Following this line of reasoning, the Mexican Fourth

Line Regiment took its initial position some 400 yd to the east of the road fork, with Torrejón's cavalry units stationed to the immediate east and west of the fork. During the final phase of battle, Churchill's 18-pounder battery would have been positioned on this road approximately where the Mexican left flank initially was stationed, that is, near the road fork. Also in this vicinity were the Artillery Battalion, the Fourth Infantry and May's Dragoons (Figure 14).

The Resaca (Area C)

A number of battle accounts (e.g. Taylor 1846; Scarritt 1846; Anon. 1850) emphasize the tactical significance of a resaca where it bordered the west side of the above-mentioned wagon road. These "woods and marshes difficult to overcome" anchored the Mexican left flank. Undoubtedly this is Area C. Probably within Area C, bounded on three sides by a loop of this resaca, Torrejón carried out his flanking attempts. Likewise probably within this area the U.S. Third and Fifth Infantry regiments, Ringgold's battery and Texan volunteers took their defensive positions to force the Mexicans back (Figure 13).

Tanques del Ramireño Road (Area D)

This dirt road probably is an actual segment of the old Tanques del Ramireño Road, the route taken by the Mexican army when they first entered the battlefield. A ground check revealed this is still the most practical route when one approaches the open prairie of Palo Alto from this direction; a more linear, direct approach is impractical due to two resacas, both visible on the aerial photograph. These resacas cause the road to loop well to the east.

***Motitas* (Area E)**

Given the fact there are no other low rises in this area of the battlefield, undoubtedly Berlandier's *motitas* are these same two low rises identified as Area E. One of these low rises was described by the Mexicans as "the hill of Motisas" (Berlandier 1846:9; In Sanchez 1985:15). Local tradition refer to these two low hills as *las motitas de Arista* or "Arista's Hills", in the belief General Arista placed his field headquarters here (Walter Plitt, personal communication 1992). Regardless of where Arista pitched his tent, the *motitas* provided a natural albeit meager anchor for the Mexican right flank. Also, the Mexican provision wagons were placed behind "the hill of Motisas" to exploit its relative protection (Anon. 1846c:9; In Sanchez 1985:15).

A line running east-west between Area E and the road fork of Area B should then represent the approximate location and axis of the initial Mexican battle line (Figure 10). The distance between these two defined areas is a little less than a mile. Mexican records noted their battle line consisted of 3,300 men (it is not clear if this included cavalry units) "...two men deep, without secondary lines, nor reserves, nor any concentration of troops whatsoever" (Berlandier 1846; In Sanchez 1980:12). Two lines of men, each line thus consisting of some 1,650 men with each man allotted "two paces" (five feet) of linear space, the regulation spacing between Mexican soldiers (Orga 1808:128; Anon. 1846c; Hefter et al. 1958:51), would have resulted in a battle line 1.5 mi long. Additional space for artillery pieces between the units would have extended the line a bit further, and Mexican cavalry on the flanks would have extended the Mexican battle line even more.

Marshy Area (Area F)

As previously noted, Berlandier's sketches, Ramsey's map and Maps A and B show the existence of a broad marshy feature between the two battle lines. The only candidate for this topographic feature is Area F. A ground check of Area F revealed a predominance of water-loving plants within its confines; there is a drainage stock located more or less toward the center of this feature. Presumably if the stock tank were removed, this seemingly innocuous portion of the battlefield would soon revert to its pristine, bog-like characteristics. If Area F was avoided by both sides as a tactical hazard, then Mexican-related artifacts, mixed with U.S. ordnance, should lie to the south and east of this feature; conversely, U.S.-related artifacts and Mexican ordnance should lie north and west.

***Lomas Tendidas* (Area G)**

Area G is notable in that it seemingly does not exist as a topographic feature today. A ground check showed this area to be typical Palo Alto prairie with virtually no relief. Nevertheless, some sort of linear natural feature once existed in this area since three battle maps indicate it: Berlandier's sketches, Henry's Map B and Dobbins' Map C. These maps show it as a belt of "thick chaparral". Biologist Norman Richard (personal communication 1993) believes the soil found on this area of the battlefield, in fact, would have supported such a vegetation cover.

Area G probably was the low levee that still borders the resaca east of the *motitas*. This levee, in 1846, may have supported brushy vegetation because it was significanly higher in elevation at that time. Even today, Area G becomes more apparent when heavy rains inundate the lower elevation lands surrounding the old levee. This may have been the situation the day of the battle.

The above hypothetical conclusions are not offered as "truth" or "fact". They are simply possible explanations, open to continued testing and revision upon the discovery of new facts. Investigation, therefore, is required of both documentary and nondocumentary data, that is, data tied to the field environment where the battle took place. This is the realm of archeological investigation, discussed in the following chapters.

CHAPTER SIX

ARCHEOLOGICAL FIELD RESEARCH METHODS

Research Proposal

In April 1992, the NPS submitted a research design on the Palo Alto battlefield to the Texas State Historic Preservation Officer (SHPO). This document (Haecker 1992) provided the framework for a more in-depth survey of the battlefield, as recommended 13 years earlier by Texas A&M (Bond 1979). NPS personnel were to conduct the survey during the summer of 1992. The following is a synopsis of the research design submitted to the Texas SHPO before the 1992 survey. Statements in bold face type are either initial theories or historical assumptions eventually found to be incorrect or debatable, or proposed field methods later modified or abandoned.

Proposed Investigative Theory and Practices

The principal goal of the Palo Alto battlefield investigation is to further define general battle lines identified by previous researchers (Bond 1979; Sanchez 1985; Champion n.d.). Based on their findings, it is presumed:

1) recovered artifacts will be primarily of a military nature consistent with what is known about Mexican and U.S. military items used in 1846;

2) the battle was essentially an artillery duel, therefore, most of the artifacts will be artillery munitions;

3) concentrations of artifacts will generally correlate with battle lines of both sides with U.S. munitions largely on the Mexican line and Mexican munitions largely within the U.S. line;

4) there has been an adverse effect on the site due to relic hunters;

5) some portion of the recovered artifacts may pre- or post-date the 1846 battle, reflecting other historical events;

6) the ground surface is largely obscured due to agricultural and natural vegetation cover. Also, water and wind-related deposition and erosion actions have buried many of the artifacts below the surface, to a depth of approximately 4-6 in; and

7) natural deterioration of the artifacts, especially iron and steel, is great.

Military Equipment and Archeological Expectations

Expected archeological remains associated with the 1846 battle will reflect the nature of the confrontation, that is, an artillery duel. Large-scale, hand-to-hand combat which characterized later battles of the Mexican-American War did not occur at Palo Alto. During this first battle of the war, approximately 3,000 U.S. artillery rounds were fired, while the Mexican artillery fired only around 650 (Brooks 1965:135). A combination of superior cannon, effective use of canister and spherical case shot, and rapidity of cannon fire by U.S. forces resulted in devastation of the Mexican army. Based on various battlefield accounts, most of the artillery-related artifacts probably will be of U.S. origin.

United States Arms and Equipment

To date, there are no known contemporary listings of all types of small arms used by the U.S. army during this battle. However, previous researchers (Bond 1979:18; Bateman 1982:32-36) believe the principal small arms of U.S. troops consisted of the U.S. Model 1835 flintlock musket in .69 caliber, or the U.S. Model 1841 musket or rifle in .52 caliber. Possibly a few of the breech-loading Model 1819 Hall carbine rifles, modified for percussion caps and .52 caliber rounds, also were used. However, an unknown quantity and variety of other types of firearms were present.

Those U.S. troops armed with the Model 1835 musket were issued lead balls in paper cartridges, either in single round-ball and black powder cartridge or a ball with three buckshot ("buck and ball) cartridge. The Model 1819 Hall rifles took a .52 caliber round ball in a paper cartridge. **A mix of both flintlock and percussion cap muskets and rifles was in service during this battle; therefore, percussion caps may be found particularly along the U.S. army battle line.** Bayonets for the above small arms were of the angular offset-blade socket type with clasp ring (Webster 1965).

No information is available on all the varieties of handguns used in this battle. However, the most common U.S. army-issue pistols present probably included the Model 1836 flintlock and the Model 1842 percussion, both in .54 caliber (Bond 1979:18).

The U.S. artillery in this battle consisted of Model 1840 6-pounder and at least two 18-pounder iron siege or garrison guns. **12-pounder howitzers were not used during the battle.** Ammunition for the 6-pounder guns included shot, spherical case and canister; the 18-pounder guns fired shot, spherical case, grape and canister. Shot is a solid, nonexplosive, conventional cannon ball. The U.S. shot was made of cast iron, Mexican shot was commonly made of copper or cupreous alloy. Grape consisted of a stand of nine small iron balls stacked in three rows with three balls to the row and held in vertical column between two iron plates by an iron bolt. Spherical case consisted of a hollow shot filled with lead balls and an exploding charge fused to detonate in flight. Canister consisted of a metal sheet cylinder filled with iron balls (Bond 1979:18).

In 1846, the U.S. Army uniform consisted of dark blue jackets, sky blue pants, and cloth fatigue caps; epaulettes were hardly ever worn in battle (Allie 1991:4). Metal objects associated with this uniform would include gilt brass buttons (with the letter "I", "A" or "D" on the button to indicate Infantry, Artillery or Dragoon, respectively), eagle hat insignias, and belt buckles with the letters "US" (U.S. War Dept. 1841:379-381). Metal objects normally associated with civilian clothing, such as plain brass and lead or pewter buttons, as well as items of a personal nature also may be present along the U.S. battle lines.

Mexican Arms and Equipment

Most of the Mexican small arms were of European manufacture, consisting primarily of the antiquated English India Pattern "Brown Bess" flintlock musket. The Brown Bess was manufactured in .75 caliber and used a socket bayonet (Bateman 1982:38). Other small arms used by the Mexicans may have included the British Baker rifle, caliber .625; the Prussian Model 1839 *Tigre* rifle, caliber not yet identified; and a blunderbuss-type weapon called an *escopette* or scuppet, used by the Mexican cavalry and lancers. There probably is no specific caliber for this weapon; rather, any type of lead ball that could roll down the barrel would have been used. Types of Mexican handguns are unknown, but likely only officers and perhaps the cavalry would have carried them. It also is likely such weapons would have been flintlocks (Bateman 1982:39).

Exactly what type of artillery pieces the Mexicans possessed at Palo Alto is not known. However, a list of Mexican ordnance and ordnance stores exists in the inventory of captured property resulting from the battle of Resaca de la Palma, fought the day after the battle at Palo Alto. This list is as follows (Larnard 1846):

> Six 6-pounder cannon, field pieces;
> Two 12-pounder cannon, field pieces;
> Ammunition boxes for same, containing 49 rounds of 6-pounder canister, fixed;
> Ammunition boxes with 7 rounds of canister for 12-pounders;
> Five boxes, containing 40 rounds of 12-pounder canister;
> 36 rounds of 6-pounder strap-shot, fixed;
> Limbers, with mules and harness, belonging to the eight pieces; and
> Three bags of slow-match and priming tubes.

Ordnance captured at the later battle of Monterrey, fought in September 1846, showed the Mexican army possessed 3-pounders, 4-pounders and 7-inch howitzers (Brooks 1965). There is no mention of spherical case or grape in the inventories of Mexican equipment from either inventory; however, some battle accounts occasionally mention use of grape by the Mexicans (Brooks 1965; Grant 1885). Most of the Mexican cannon shot was made of copper or cupreous alloys, as opposed to the iron shot used by the U.S. One Mexican copper solid shot was recovered during the 1979 archeological investigation of the Palo Alto battlefield. This artifact weighed 4.76 pounds and measured 3.12 inches in diameter (Bond 1979:19).

No detailed information is available on the uniforms of the Mexican troops that specifically fought at Palo Alto; however, the elite units presumably wore elaborate uniforms that included buttons and other brass accouterments bearing the Mexican eagle and snake. Under a series of detailed regulations issued in 1839, the Mexican enlisted soldiers were to be issued colorful but relatively plain cloth coats and trousers with leather shakos. However, the rank and file reportedly often fought in sandals and cheap cotton garments (Nevin 1978).

Testable Assumptions: Battlefield Locations

Historical documentation and previous archeological investigations of the battle allow for a number of archeologically testable assumptions. These assumptions depend on artifact function and national origin, and a period of use no later than 1846. Keeping in mind the primary goal of the project, the identification of the initial Mexican and U.S. battle positions, the following testable assumptions, primarily from the 1979 archeological results, are as follows:

1) the initial Mexican battle line was anchored on its right (east) flank by a small elevation. From this elevation the Mexican line extended to the west for approximately 2000 yd, up to the now abandoned Matamoros Road; and

2) the initial U.S. battle line was parallel to the Mexican line, and approximately 700-800 yd north of it.

Utilizing what is known about the battle, the initial Mexican line will:

1) contain a much higher level of spent and fragmented artillery ordnance than the initial U.S. battle line;

2) contain cannon balls mostly made of iron;

3) contain solid cannon balls which will be of two sizes: 6-pound (3.5" diameter), and 18-pound (5.2" diameter);

4) contain metallic parts from Mexican uniforms and metal parts from Mexican-related small arms, for example Brown Bess muskets; and

5) contain some copper cannon balls, due to spillage.

In contrast, the U.S. battle line will:

1) contain a relatively lower level of metal;

2) contain, for the most part, cannon balls made of copper; and these cannon balls will be of two sizes: either **6- or 8-pound, and 12-pound**;

3) contain some iron cannon balls, due to spillage; and

4) contain a significant amount of musket balls on its west end due to Mexican outflanking attempts there.

Proposed Field Methods

The following proposed field methods were modified in part during the actual survey. Portions of the proposed field methods modified at the time of survey, or found to be incorrect, are noted in boldface type and are discussed in Chapters Seven and Eight.

The 1992 field investigation will consist of three phases: orientation, survey and recording with collection. **There will be no discrimination in recording and collecting on presumed period association.** Aboriginal, pre-battle, battle-related, post-battle related **and recent historical artifacts** will be considered equally.

Orientation

Aerial photographs will be made of the battlefield before archeological fieldwork begins. The area to be flown measures 14,200 ft North-South by 11,200 ft East-West, encompassing approximately 3,670 acres. The actual battle area to be surveyed is well within this acreage. Nominal scale of the photographs will be 1:6000 (1" = 500'). Paneled ground control points, established using the taking of the aerial photographs, will provide the control needed to allow for photogrammetric mapping, employing analytical bridging techniques.

The surveyors who establish the paneled control points also will establish a series of staked data points, spaced **1,000** ft apart, between the paneled control points. These additional data points will provide a reference grid for the survey, recovery and recording phases. The archeology field crew will establish additional staked data points as needed and tied into the reference grid. All data points will be tied into the U.S. Geological Survey bench mark presently located on the battlefield.

The project area will be surveyed based on a system of prioritized parcels and tracts, using information from the methodological approaches and findings of the 1979 season. Parcels and tracts given the highest priority are those not archeologically surveyed, or minimally surveyed in 1979, that possess a high probability of containing battle-related artifacts. Second priority areas will be those portions systematically surveyed in 1979 and found to contain battle-related artifacts. The lowest priority will be given to those areas that, according to historical and archeological documentation, are outside the battlefield proper and, therefore, outside the present scope of work. However, these low priority areas will be included in future investigations since they may contain evidence of the earthworks that protected the U.S. army's wagon train as well as evidence of the Mexican army's post-battle mass graves and encampment. To identify their presence, such features will require other methods of remote sensing not scheduled for this proposed project.

All non-tree vegetation within the above-selected survey areas will be removed before the actual survey. This must be done to allow the use of metal detectors as well as for visual inspection of the ground surface. The chosen method of vegetation removal, either by close cropped mowing or by burning, will be based on the preferences of the various parcel owners.

Survey

The chosen method of survey is the use of electronic metal detectors. Visual inspection of the surface will be done, when possible, concurrently with the metal detector survey. The survey crew will consist of two professional NPS archeologists and local amateur volunteers, with the volunteers supervised by the archeologists. All personnel using metal detectors will be aligned at 15-ft intervals and oriented to grid cardinal directions. The surveyors will proceed in line, using a sweeping motion to examine the ground, with each operator covering a sweep of approximately 5-7 ft. A pin flag will be placed at each target located by an operator. As soon as the location is pinned, the operator will continue along the transect. In some instances, the target location will be exposed immediately so the operator can check on machine performance, that is, establish the degree of accuracy of a given machine in ascertaining artifact depth, metallic type and size. Objects found on the surface also will be marked with pin flags and left in place for recording and recovery.

Recording and Collection

Individual artifact locations will be measured to within 1-in accuracy in distance using an electronic theodolite. Provenience data will then be downloaded into a PC software program and processed at the Division of Anthropology, Branch of Cultural Research, Remote Sensing Section, Southwest Regional Office of the NPS. This will create a computer map, showing artifact distribution. Since this data is tied into the aerial photos of the site via ground controls, it will be possible to overlay artifact distribution onto a photogrammetric map.

The collection phase will consist of the removal of both surface and subsurface artifacts. As noted in Bond (1979), subsurface artifacts are within 6 in of the ground surface. Artifact removal will be done as soon as it is documented, as it is possible pin flagged artifacts left overnight could be taken by relic hunters. Perishable artifacts, if encountered, also will be recorded and collected for analysis and curation. In the unlikely event human remains are encountered, no further exposure will occur after confirmation. Such remains, as exposed, will be described, photographed, and their exact provenience obtained. Any associated artifacts will be provenienced, photographed in situ with the remains, and collected. Exposure of human remains will be limited as much as possible. Information regarding such a discovery will be limited to NPS personnel for protection of the remains.

Following NPS Archeological Documentation Manual guidelines, field records will be kept in a field specimen (FS) catalog, with each recovered artifact given a sequential FS number. A general description of each artifact at the time of its recovery also will be included in the FS catalog. Each artifact will be placed in its own container, appropriate for its size and state of fragility.

The site will be photographed with both black-and-white print and color slide film. Photographs will document the general physiographic setting of the site as well as the various survey activities. Where appropriate, each photo will contain a scale, north arrow and sign board. An in-field photo log will document each exposure and include the subject, its FS number, direction of view, date and photographer. A video camera also will be used to document the project.

Fieldwork also will include the recording of artifacts previously collected by relic hunters as well as those now curated by local museums and archeology laboratories, for example, Texas A&M and TI&M. Provenience information for artifacts in the possession of relic hunters will be general at best; therefore, such information only will be used to supplement the findings of this investigation. NPS personnel will obtain descriptive documentation of those artifacts in the possession of cooperative relic hunters. If possible, the NPS will acquire, either by gift or loan, these artifacts for further study and possibly for display at the proposed Palo Alto Battlefield Visitor Center.

Laboratory Methods

State-of-the-art laboratory procedures will be used in cleaning and stabilizing the artifacts. The actual task will be contracted to a professional conservation laboratory. Essentially, the tasks will include the removal of accumulated dirt from each artifact, then determining the condition of the artifact to ascertain what conservation method(s), if any, is needed. Sorting and identifying the artifacts will be undertaken by personnel experienced with artifacts of this period. More specific artifact analysis, involving the subsorting of artifacts into further identifiable discrete types, will be conducted by the NPS Project Director and a trained assistant.

Artifact analysis will address the basic goal of the research orientation which is the identification of the Mexican and U.S. battle lines. Categories of investigation will include: artifact function such as arms and ammunition, uniforms and personal possessions; and diagnostic attributes such as manufacturers' marks and military unit insignia. Occurrence frequencies for artifact types, for example, Mexican and U.S. uniform buttons, iron and copper artillery ordnance, .69 caliber musket balls, in conjunction with their provenience data, will result in the identification of the location and nationality of battle lines. The artifacts, notes, records and other documentation will be archived at the NPS Southwest Regional Office in Santa Fe, New Mexico.

Applied Field Methods of the 1992, 1993 Field Seasons

Orientation

Before beginning the 1992 survey, a permanent reference grid was created over the proposed 3,400 acre park. The grid consisted of 50 permanent data points spaced 1,600 ft apart, not 1000 ft as was proposed in the research design. This modification was possible due to the ability of the theodolite to accurately read distances of up to .5 miles. Four temporary data points were later added, placed within the identified core battlefield area to facilitate proveniencing of artifacts. A permanent datum consisted of a piece of steel reinforcing bar pounded flush with the ground with an aluminum cap giving its numerical designation. For convenience the grid was oriented parallel and perpendicular with Farm-Market Road 1847, which is the western boundary of the proposed park; this road is aligned on grid north.

Orientation also included teaching volunteers about battle history, proposed survey methods, artifact identification and recording methods. Several of the volunteers are experts in the use of metal detectors; they provided instruction regarding proper operation of these tools.

1992 Survey

As is often the case for an archeological project, a disparity in field techniques occurred, regarding what was proposed and what reality required. The 1979 survey report recommended 100 percent removal of the vegetation before any future survey of the battlefield. This recommendation was based on the earlier surveyors' observation that mowing the cordgrass left stubble that prevented adequate contact of the metal detector coils with the ground surface (Bond 1979:27, 58-60). Since mowing the cordgrass apparently was an inappropriate method of vegetation removal, burning off the vegetation was the logical alternative; a burn-off of a portion of the battlefield by a landowner in 1990 exposed enough ground surface for the successful use of metal detectors by relic hunters (Walter Plitt, personal communication 1992).

However, several environmental and legal concerns quickly became issues while scheduling a controlled vegetation burn-off of approximately 600 acres of cordgrass: such a burn-off would have an adverse effect on potential habitat for a number of rare and endangered species that could exist in the area; the resulting smoke of such an extensive fire would be a major source of air pollution; and the fire could escape its confines and damage adjacent lands not authorized for burning.

Fortunately, while the above environmental concerns were being addressed, it was possible to survey portions of the battlefield not requiring vegetation removal. The first area scheduled for investigation was an 80 acre plowed field, chosen for its absence of vegetation (Figure 36). In 1979, this field was subjected to a systematic magnetometer and metal detector survey, resulting in the location of only five battle-related artifacts (Bond 1979). It was initially presumed the results in 1992 would be similar or worse. However, for the purpose of learning how to use the metal detectors, any subsurface metal artifacts would suffice.

The initial results were unexpectedly rewarding. After three days of survey, 26 battle-related artifacts were recovered within three sample areas, totalling seven acres. In other words, instead of recovering at best one battle-related artifact per 16 acres in this particular field as was done in 1979, one could now expect close to four such artifacts per acre. This notable improvement in surveyed acreage/artifact recovery ratio was attributed to improvements in metal detector technology made since the last archeological survey of Palo Alto. Familiarity with various metal detectors used during the initial phase of survey indicated the most technologically advanced models are capable of: giving accurate readings of subsurface metal even when the metal detector is suspended over four inches above the ground surface; discriminating between metal and salt concentrations that often were responsible for false readings by earlier models; and providing readings of metal to a depth much greater than the metal detectors used during the 1979 survey.

These observations provided an alternative to burning off the cordgrass, which was close-cropped mowing as was done in 1979. In addition, the use of superior metal detectors permitted survey of densely vegetated areas that, although not covered by cordgrass, can still inhibit the effectiveness of other, less sophisticated metal detector models (Figure 37).

It was now obvious the battlefield contained many more artifacts than initially assumed (Figure 38). It also was apparent a 100 percent survey of hundreds of acres was now beyond the scope of the 1992 field season; at the rate of three surveyed acres per day, it would take over two years to complete the survey of the core battle area.

Accordingly, several sampling strategies were devised in place of prioritizing tracts for intensive, 100 percent survey as was initially planned (Figure 39, pocket insert). These strategies consisted of:

1) contiguous placement of seven 500 x 100 ft Search Areas (SAs) along a north-south axis, forming one transect measuring 3,500 x 100 ft. This transect, consisting of SAs 3-11, was positioned to find

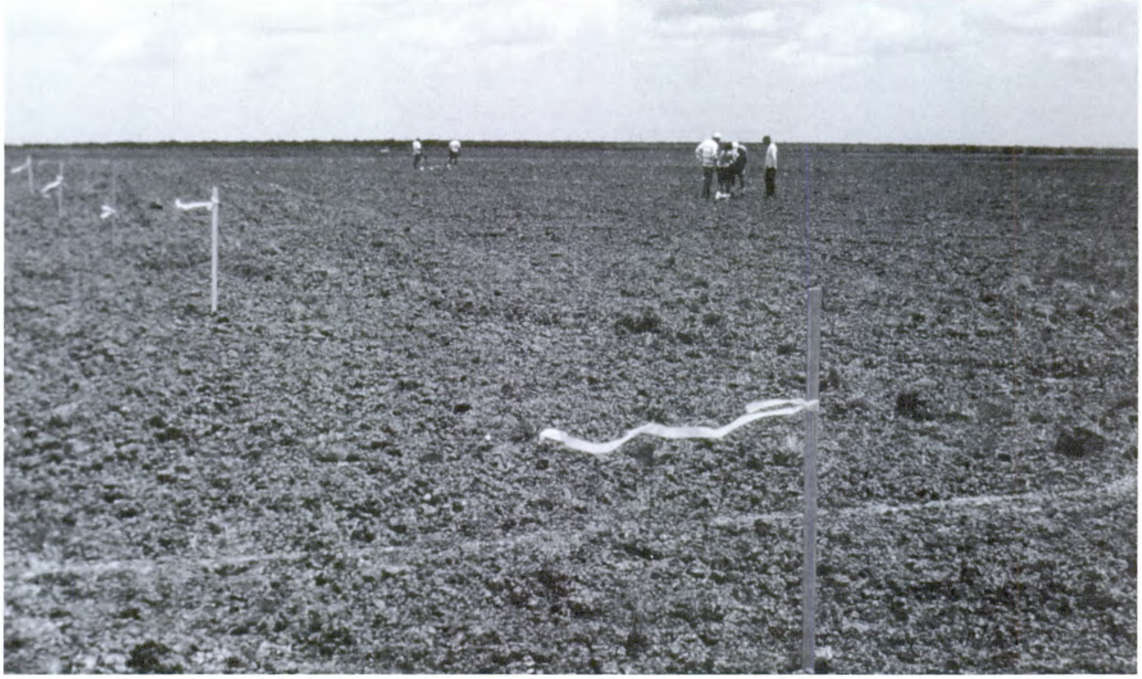


Figure 36. Metal detector survey of plowed field, SAs 2-12 (See also Figure 39). Wood lathes demarcate SA units. Looking NE.

the approximate western edge of the core battle area. Eight other transects, each measuring 3500 x 30 ft along a north-south axis, also were surveyed. These transects were positioned in series to find the approximate eastern edge of the core battle area (Figure 40). It was expected survey of these transects would result in discovery of segments of both Mexican and U.S. battle lines;

2) discrete placement of 16 SAs, each measuring 500 x 100 ft, and all within the core battle area. Placement of these Search Areas was done using a stratified random sampling strategy, involving random placement of sample SAs within historically documented **activity localities** of the core battle area; and

3) reconnaissance-level survey sweeps, involving the use of one or more metal detectors over informally demarcated or topographically defined areas, such as pastures and resaca levees. This survey approach could quickly determine the presence or absence of artifacts within a given area, occasionally providing guidance on the placement of survey units and indicating areas for future site investigations. Artifacts discovered via reconnaissance were recorded and their locations plotted, then reburied (Figure 41, pocket insert).

It also became obvious too much of the limited survey time would be concentrated on recording and collecting items of obvious recent manufacture and deposition, for example, aluminum cans and

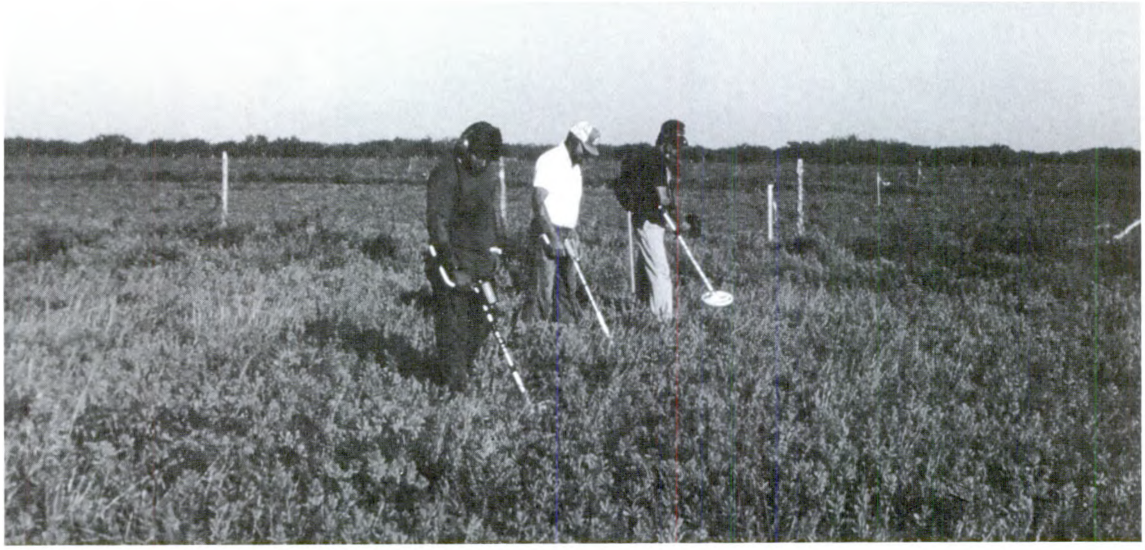


Figure 37. Metal detector survey in vegetated field. Mesquite forest on horizon demarcates Resaca de Palo Alto. Looking east.

fence staples. Accordingly, the project director made the decision regarding what to record or not record.

Placement of transects, survey units and reconnaissance sweeps involved: 1) a general knowledge of battle lines, as per eyewitness battle narratives, historic battle maps and provenience of previous artifact findings, thus maximizing the probability of finding battle-related artifacts; 2) surveying only those properties where landowners gave their written permission; and 3) avoidance of potential faunal habitats or rare and endangered species, as defined and proscribed by the U.S. Fish and Wildlife Service.

The four activity localities sampled during the 1992 field season include:

1) the presumed scene of action where both the U.S. and Mexican cavalry units attempted flanking maneuvers on the western side of the core battle area. Both sides failed in this tactic primarily due to the successful defensive use of cannon. This locale should contain quantities of iron and copper grapeshot as well as some cavalry related equipment and small arms ordnance. SAs 1-12, 99-101 were positioned within this activity locale;

2) the initial battle position for the Mexican left flank and pre-attack staging area for the above-mentioned Mexican cavalry units. This locale should be situated approximately .5 mi south of the U.S.

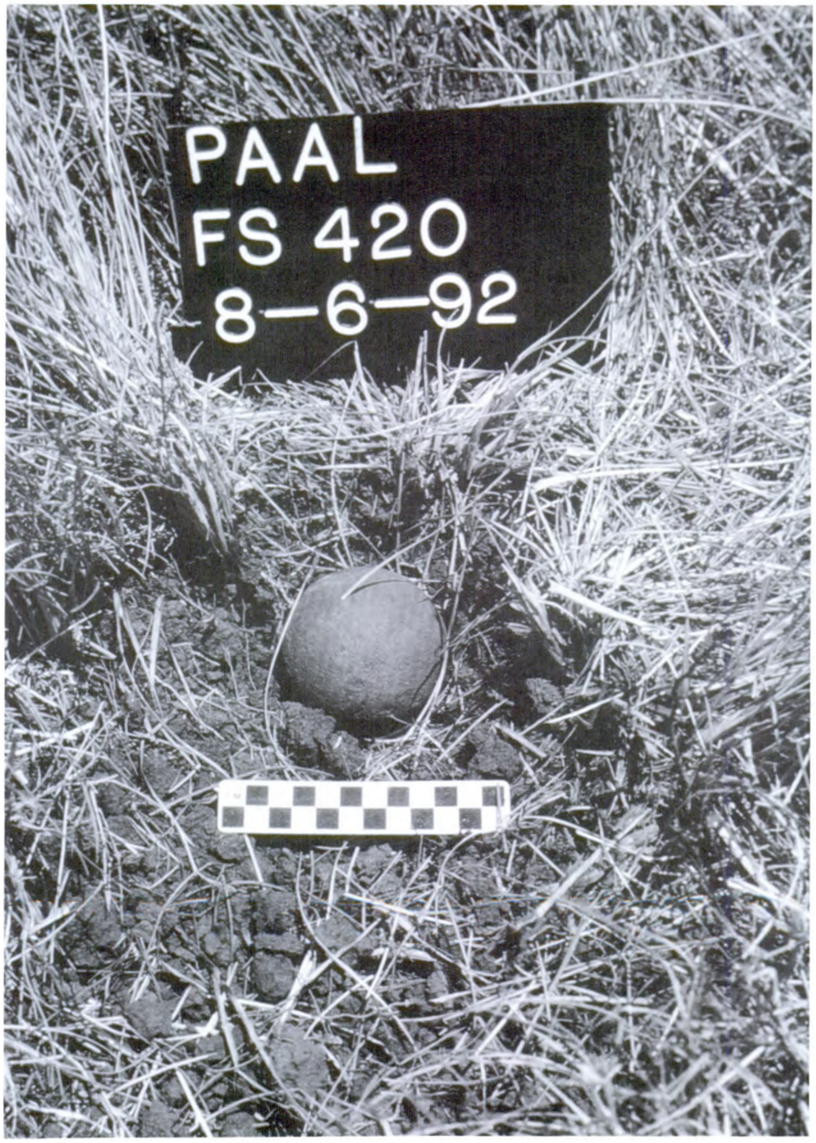


Figure 38. In situ Mexican cannon ball, north end of SA 207.

Fifth Infantry position, according to eyewitness accounts. Expected artifacts include Mexican cavalry and infantry-related equipment intermixed with U.S. cannon ordnance. SAs 200-208 were positioned within this activity locale;

3) the area north (Figure 40) and east of "Arista Hill", a heavily vegetated low rise. Local historians hypothesize this topographic feature is the low rise that, according to battle accounts, anchored the initial Mexican right flank. If this hypothesis is correct, artifacts found near "Arista Hill" primarily should include Mexican cavalry and infantry-related equipment, intermixed with U.S. ordnance. The presence of a resaca adjacent to this low rise also offers the possibility of locating Mexican soldiers'

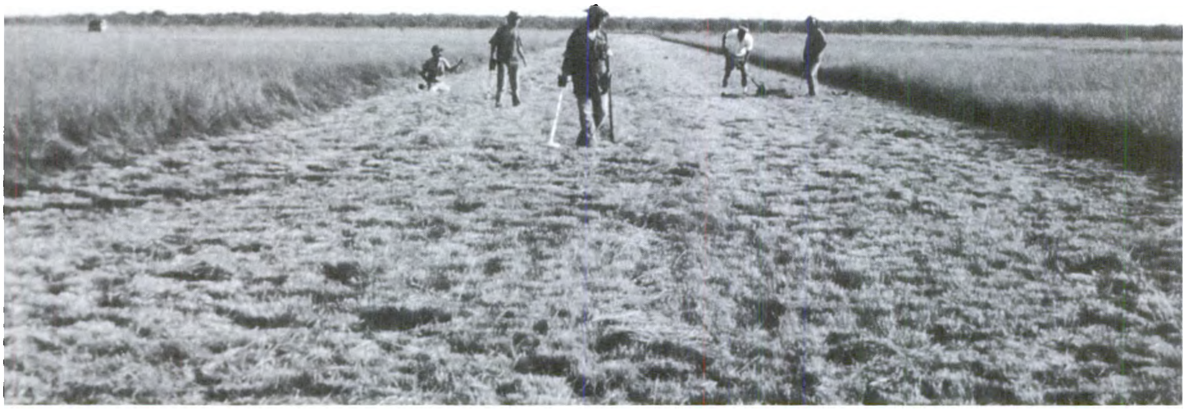


Figure 40. Metal detector survey of SA 308, after mowing of cordgrass. Looking north.

graves, since the soil within such a marshy area would be easier to excavate for burials than the surrounding floodplain. SAs 300 and 301 were positioned east and northeast of this rise, with SA 302 placed along its northern flank; and

4) the vicinity where relic collectors reportedly found significant concentrations of both copper and iron cannon balls, and articles related to the U.S. army. According to Palo Alto Committee Chairman and local historian Walter Plitt (personal communication, 1992), this activity locale is within the present-day transition zone of cordgrass and mesquite, just south of an east-west dirt road and east of a north-south dirt road (Figures 3, 39 and 41 pocket inserts). Such an artifact concentration might roughly correspond with the U.S. battle line and perhaps placement of one of its batteries. Relatively large numbers of cannon balls here could reflect Mexican attempts to destroy U.S. cannon.

It was expected the north ends of SAs 306-313 would sufficiently address this area of known artifact concentration. Therefore, SAs 304 and 305 were placed to the immediate north of the east-west dirt road and east of the north-south road, to sample an area presumably not collected by relic hunters due to its thick vegetation cover.

Using the above field methods, archeologists and volunteers together surveyed 54 acres during July-August, 1992. This encompassed approximately 4.5 percent of the estimated 1,200-acre core battle area and 1.5 percent of the proposed 3,400-acre Palo Alto Battlefield Historic Site.

1993 Survey

Field methods used during the 1993 field season were essentially the same as for the 1992 field season, with a notable shift in emphasis of sampling approaches. The reconnaissance sweep survey method was used to a greater extent, with correspondingly less emphasis on selection of stratified random survey units slated for 100 percent artifact recovery. This shift in survey methods was based on an observation made toward the close of the 1992 season, that is, the presence or absence of subsurface artifact clusters was best determined by first conducting a series of widely spaced metal detector transect sweeps over an informally defined target area, for example, an 80 acre plowed field. Such reconnaissance-level sweeps, representing an approximate five percent sample of a given target area, could be completed by a few metal detector operators in one or two days. Using this approach, an artifact cluster, if such existed within the target area, initially would appear as a widely spaced distribution of only a few artifacts.

The next task was to further delineate the artifact cluster. This was done via nonstructured but intensive sweeps around each of the individual artifact locations. These intensive sweeps would determine if an artifact in question was essentially an isolated occurrence or one of a number of artifacts within a cluster. If an artifact cluster existed, more artifacts would soon be discovered. Conversely, if no other artifacts were found nearby, the artifact would be labeled an isolated occurrence. Thus, information on the presence or absence of artifact clusters within a target area could be obtained using minimal time and personnel.

The above-described survey method has its limitations in that it cannot provide data allowing for relative comparisons of artifact cluster densities, nor can it provide a comprehensive list of artifact type(s) within a given cluster. Such data can be gained, however, through intensive metal detector sweeps of formally defined sample units. Four such sample units, SAs 209-212, were surveyed for total artifact recovery during the 1993 field season. These sample units were specifically placed to further delineate the Mexican battle line discovered during the 1992 field season. Only one artifact cluster of a U.S. battle line position was ever discovered during both field seasons, the widespread artifact cluster defined by SA 305 and the extreme north ends of SAs 306-308. As a result, during the 1993 field season, one intensive sample unit survey was deemed appropriate towards defining a portion of the U.S. battle line.

During the 1993 survey, 15 acres were intensively surveyed; an additional 210 acres were subjected to a five percent sample sweep. Thus, both field seasons combined resulted in an estimated eight percent sample of a 3,400 acre area.

CHAPTER SEVEN

ARTIFACT DESCRIPTIONS AND ANALYSES

The 1992 and 1993 archeological investigations of Palo Alto Battlefield NHS resulted in the recording of hundreds of artifacts. Most of the artifacts are attributable to the battle, the remainder are largely the result of post-battle discard. Aboriginal use of this area also took place as reflected by the recovery of a stone projectile point. Battle-related artifacts are grouped and described under the following categories: Artillery and Firearm Ammunition (includes the subcategories Lead Balls, Spherical Case and Shell, Shot, and Cannonball); Firearms; Edged Weapons; Accouterments; Personal Possessions; Farriery and Hardware; Miscellaneous Artifacts; and Human Bone. Artillery and Firearm Ammunition receives special emphasis, due to the critical role artillery played during the battle as well as being a reflection of the great abundance of artillery-related ammunition recovered from the battlefield. English measurements of caliber, inch and pound are used to describe all U.S. ammunition since this is the measurement applied by English-speaking ordnance manufacturers of the period, and, for the sake of comparison, English measurements are used for Mexican ordnance as well.

Artillery and Firearm Ammunition

Lead Balls, General

Relatively few examples of the millions of lead balls manufactured for U.S. regulation muzzle loaders exist today. Here and there specimens can be seen in museums, in collections, and even still in storage in Government arsenals. Very little work has been done towards compiling information on these once-important objects. Fortunately, most of the major varieties of lead balls have quite distinctive physical characteristics that can provide some useful information on manufacture and use on the battlefield.

During the American Revolution, the only small arms that approached standardization were those of the French and British Armies. These were various models, dating back, in many cases, to the French and Indian Wars. Specifically, the .75 caliber British "Brown Bess" used a ball supposedly standardized at caliber 0.688, weighing 1.14 oz. From examination of 70 musket balls found on British campsites (Calver 1928:120), it appears Revolutionary War-vintage Brown Bess musket balls varied from 0.687 to 0.700 caliber, with an average caliber of 0.694, and a weight of 1.14 oz.

The difference between musket ball and barrel diameters was called "windage". It was standard practice to make the ball caliber .050 smaller than the caliber of the musket barrel for which it was intended. This clearance was needed to take care of three inaccuracies (Butler 1971:18):

1) molded musket balls were not perfectly round and varied in diameter from mold to mold;

2) the barrels were not uniform in inside diameter or "bore", neither from one end to the other in a single musket, nor from musket to musket; and

3) the inside of the barrel accumulated fouling from firing with greatest buildup just forward of the chamber.

Beginning with the Model 1795 musket, its design based on the French Model 1763 musket, regulation U.S. muskets had barrel bores of .69 caliber. Due to crude manufacturing techniques of the period, the dimension was not precise, but good barrels generally ranged from .690 to .705 caliber, or a spread of .015. Up through the Mexican-American War, the standard U.S. musket ball was .640 caliber, with an approximate weight of .9 oz (Lewis 1960:108, 111).

An 1840 U.S. tactics manual (Scott 1840) states buck-and-ball cartridges were standard by this time, and apparently continued in use for at least another 35 years. Such a load was considered of great value for guard duty, Indian fighting and operations in brushy country (Lewis 1960:108). Buckshot was .310 caliber and weighed 0.09 oz. The ball for Hall rifle models, first introduced in 1819, was .525 caliber and weighed .5 oz (U.S. Ordnance Dept. 1841). These were the regulation calibers and weights used by the U.S. Army during the Mexican-American War. However, shortly after the war, a slightly larger, 0.65 caliber ball weighing .94 oz was adopted (Lewis 1960:115). The improved "swage" process of manufacturing musket balls by compression instead of by casting allowed for the decrease in windage (Butler 1971:18).

U.S. arsenals and armories traditionally have been ammunition procurement centers. In 1812, the Commissary-General of Ordnance wrote the Secretary of War that "...in the making of musket cartridges, children of 12 or 14 years of age can be employed as usefully or even more so than men...". Army regulations published in 1814 provided for three laboratories or arsenals. "At these workshops shall be...prepared all kinds of ammunition for garrison and field service". In 1825, the St. Louis Arsenal was authorized to supply troops on the western frontier; and by 1841, the Frankford Arsenal in Pennsylvania was the principal manufacturer of military gunpowder. The Frankford Arsenal eventually became the center of Government ammunition development and manufacture (Lewis 1960:167-168). According to Steven Allie (personal communication 1993), the U.S. soldier did not manufacture his own musket balls at the time of the Mexican-American War; these were provided to him ready-made and in cartridge form.

In 1846, presumably due to the Mexican-American War, lead ball compression or "swage" machines were set up at Frankford Arsenal. Such machines could manufacture balls at the rate of 40,000 per worker/per day. Similar machines eventually were installed for the Saint Louis and Watervliet Arsenals. Balls made by this method were "...more uniform in size and weight, they were smoother, more solid, and give more accurate results, than cast balls" (Ordnance Board 1846). In this method of manufacture, lead bars were fed into a machine that cut off a part sufficient for one ball; this portion was then transferred into a die that formed the ball. The balls were trimmed by hand with a knife, then passed through a cylinder-gauge for proper sizing. Buckshot were either manufactured in a similar manner to the balls, or else purchased from private shot works (Lewis 1960:185).

In lieu of the compression method, the arsenal manufacture of musket balls involved: melting lead in kettles; the molten lead then poured into gang molds; and the cooled lead balls removed from the molds and trimmed of its "sprue", the knob of waste metal formed in the mold hole. Regulations required first castings to be thrown back into the kettle since they were imperfectly round due to the cold mold. Periodic measurements of ball samples and a thorough cleaning of lead build-up in the molds were necessary. Molds that gave imperfect balls were either repaired or destroyed. Balls were smoothed by rolling in a barrel for several minutes, then run through a gauge-screen; balls not falling through the screen were recast (Lewis 1960:175-176).

As noted in Chapter Four of this report, musket balls used as shrapnel filling for spherical case rounds also were manufactured at the arsenals. The 1849 Ordnance Manual specified 38 lead balls in a 6-pounder case shot; an 18-pounder spherical case rounds contained 120 (Gibbon 1860: Appendix p. 35). Other than having a different delivery system, lead ball shrapnel should have had the same caliber and weight, as well as passed the same quality controls, as those shot from a musket.

At present, very little is known or documented about the Mexican method of supplying troops with ordnance including musket balls. Yet it is known Mexico did not maintain as efficient an arsenal system as the U.S. in 1846. Machinery in Mexico's only quality small arms arsenal had been in disrepair since at least 1834 (Hefter et al. 1958:53). Thus, Mexican lead balls conceivably were made using molds by ad hoc details of soldiers and by relatively small, civilian-operated "cottage industries". Under such a system of dispersed manufacture, quality control may have been difficult to maintain: significant numbers of delivered musket balls would be misshapened due to cold, misaligned or poorly maintained molds; others would have only partially removed sprues; and there would be a lack of overall smoothness because of dispensing of the final ball manufacture stages of barrel-rolling and gauge-screening.

One thing to consider regarding Mexican musket ball manufacture is the relatively crudely made metal parts and correspondingly low tolerances characteristic of muskets used by many of their soldiers. Most Mexican soldiers were armed with the British India Pattern "Brown Bess" musket, manufactured in vast quantities during the Napoleonic Wars. To increase its production during that war, even less exacting tolerances for viewing and proof, that is, bore caliber and chamber pressure, respectively, were allowed for this stop-gap musket model (Darling 1981:50). In 1833, the British had 440,000 of these then-obsolete weapons, of which 264,000 were condemned as unserviceable. Hefter et al. (1958:53) states Britain sold muskets to Mexico primarily, if not exclusively, from the condemned group during the 1830s. If true, then many of the Mexican soldiers at Palo Alto may have been armed with muskets having barrel bores of substandard calibers. Therefore, a soldier using a musket with a bore that was too small (for example, .71 caliber instead of the standard .75 caliber) would mean that it would be extremely difficult, if not impossible, to ram a standard issue musket ball down a "tight" barrel. In fact, on several investigated Civil War battlefield sites, there is archeological evidence that indicates soldiers on the battle line discarded approximately 5 percent of their Minié balls because the were incorrectly manufactured, that is, misshapened or having calibers greater than what was required for their firearm (Babits and Manesto 1994).

The Mexican armed forces used a poor quality gunpowder (Thompson 1846:173), which meant they needed unusually large powder charges for their muskets to obtain sufficient ball velocity. Such charges would have quickly resulted in especially thick residue buildup in the barrel. Barrel bores may have become so fouled after several firings that it became difficult, if not impossible, to ram down the musket ball, necessitating a thorough cleaning of the barrel to make it serviceable again. In contrast, American gunpowder was of superior quality. Actual tests of American gunpowder used during this war demonstrated it was considerably better than specifications required (Lewis 1960:32).

Lead Balls From Palo Alto Battlefield

For the purpose of this report, the generic term "lead ball" is adopted instead of "musket ball" since items in this category were used as ball shrapnel for U.S. spherical case shot, Mexican canister or bag shot (rarely), and projectiles for rifles, pistols and muskets.

A total of 359 lead balls were recovered. Of all artifact categories this is numerically the largest, representing approximately 40 percent of the total collected artifacts. Lead ball analyses involved monitoring calibers and weights as well as the presence or absence of sprues, mold seams, gouges, cuts, and out-of-round characteristics due to impact, that is, faceting and flattening. Lead balls also were checked for powder flash, an attribute occasionally present if the object was used as a firearm projectile. Monitoring these attributes was expected to identify nationality of origin, method of manufacture and manner of use on the battlefield. Together with its exact provenience data, the resulting information could identify and delineate specific events both within battle lines and in areas of intense battlefield activity between battle lines.

Caliber measurement provided identification of the national origin of a lead ball: if it measured between .630-.670 calibers inclusive, it was identified as U.S. (g, Figure 42); if between .671-.750+ calibers, it was Mexican (e,f, Figure 42). Lead balls of around .620 caliber are ammunition for a British-made Baker rifle used by the Mexican army (c, Figure 42). One lead ball of .520 caliber is identified as ammunition for the U.S. Hall rifle (h, Figure 42). Many lead balls were out-of-round, therefore, caliber could not be monitored. In such instances, weight was used to assign national origin. Median weight for caliber-measured U.S. lead balls was .86 oz, and for Mexican lead balls, 1.16 oz.

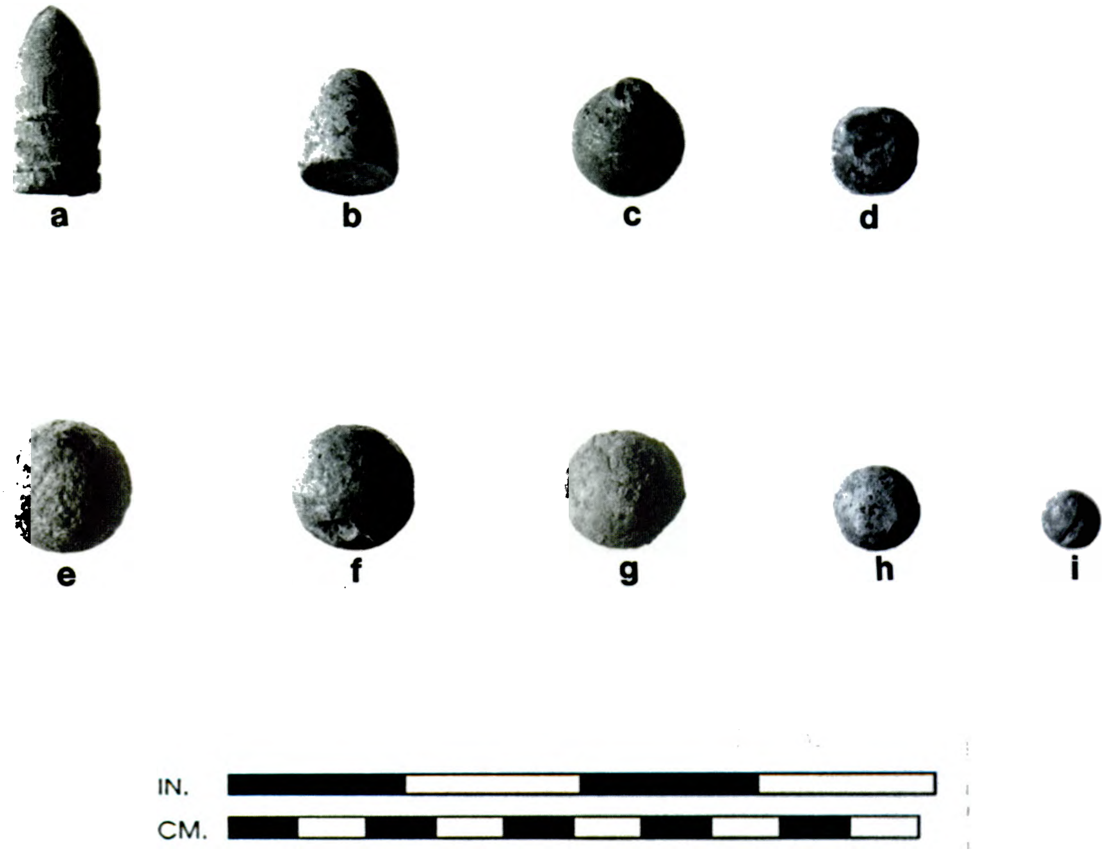


Figure 42. Lead balls. a: .58 cal. Minié ball, Civil War era; b: .54 cal. conoidal bullet; c: .62 cal. ball, for Baker rifle (note sprue); d: .50 cal. ball shrapnel from Model 1897 cannon round (note facets); e: ball For .75 cal. India Pattern musket; f: ball with teeth marks; g: ball shrapnel from U.S. spherical case round; h: .52 cal. ball, for Hall rifle and carbine; i: .30 cal. buckshot.

Some error in assigning national origin may have occurred since muskets of both armies conceivably could use lead balls ranging between .67-.68 calibers, or between .88-.95 ounces. Fortunately, only 8 of the total 359 lead balls fall within these caliber and weight ranges. Thus, most of the lead balls presumably are correctly assigned, supported by lead ball patterned groupings based on these assignments.

Figure 41 (pocket insert) shows the distribution of all lead balls within the sampled areas of the battlefield. Readily apparent is that the greatest concentrations of lead balls are on the Mexican battle line as identified by SAs 200-212. Attribute analyses indicate these balls are both Mexican and U.S. in origin. Further, Figure 41 denotes occurrences of lead balls both as relatively dense clusterings and as more or less isolated occurrences.

Patterning within SA 209 was especially informative. Virtually all of the artifacts found within this search area fall within two major clusters, designated clusters A and B (Figure 43). These clusters are approximately 100 ft apart, and no artifacts occurred between them. Possibly these clusters reflect General Arista's order towards the end of the battle that his soldiers advance "twenty varas", about 60 ft, so they should not be near "the first to fall, hearing their moans" (Ampudia 1846:17).

Cluster A had a pronounced linear distribution about 400 ft long on an almost north-south axis. The cluster consisted primarily of U.S. lead balls as well as a few U.S. spherical case shot fragments and iron balls from 6-pounder canister rounds. Several Mexican-related items, that is, a sword hilt, belt stud, brass cap, gun part and button, also were present within this cluster. An explanation for this striking linearity is that it reflects the final Mexican battle line position. The ground explosion of a U.S. spherical case round may have propelled a cone or fan of shrapnel an indeterminate distance, with a linear formation of human targets acting as a break to the forward motion of the shrapnel. Some shrapnel would fly harmlessly over the heads of the intended victims, landing hundreds of feet away, some shrapnel would be carried off the battle line inside the wounded and killed, and some would hit the targets but not penetrate. Presumably the latter then fell to the ground, creating a linear pattern. The presence of a widespread scatter of Mexican lead balls within the cluster could have been the result of scattering unused lead balls (either in cartridge or in loose form), part of the general deposition of Mexican equipment resulting from such an ordnance explosion.

Three, relatively compact concentrations of lead balls composed Cluster B. Two concentrations consisted entirely of Mexican lead balls, the other mostly U.S. lead balls. The latter cluster probably resulted from an 18-pounder spherical case round. A fragment of such ordnance was within the U.S. lead ball concentration, along with some Mexican accouterments, such as buttons, a buckle and a gun part. Thirty-two of the Mexican lead balls that made up the other two concentrations are round, that is, they do not exhibit flattened surfaces. Such nondeformed lead balls likely represent unfired and lost paper cartridges.

Thirteen of the total 47 Mexican lead balls from SA 209 are faceted, perhaps a result of hitting against other lead balls inside a soldier's ammunition pouch (Larry Babits, personal communication 1994). If such is the case, then at least some Mexican soldiers were not issued paper cartridges that protect the lead balls from battering but, instead, lead balls in loose form. (This would also mean the gunpowder was issued in loose form as well and stored in a powder horn or flask). It is less likely the faceting of Mexican lead balls is the result of their battering against each other upon explosion of a spherical case round since, at Palo Alto, the Mexican army did not use this type of explosive ordnance. Two Mexican musket balls are flattened due to their having been fired. This raises a question: from where were they fired? If Mexican soldiers fired toward the Americans, one would expect their musket balls to have landed somewhere away from their own line, not where they stood. One possible explanation is the unintentional firing of muskets when muskets and men were hit by U.S. shrapnel, resulting in some balls being deposited nearby. Possibly these lead balls were fired from an earlier Mexican battle line position. In effect, SA 209 may have exhibited a palimpsest of two artifact depositions resulting from battle events widely separated in time.

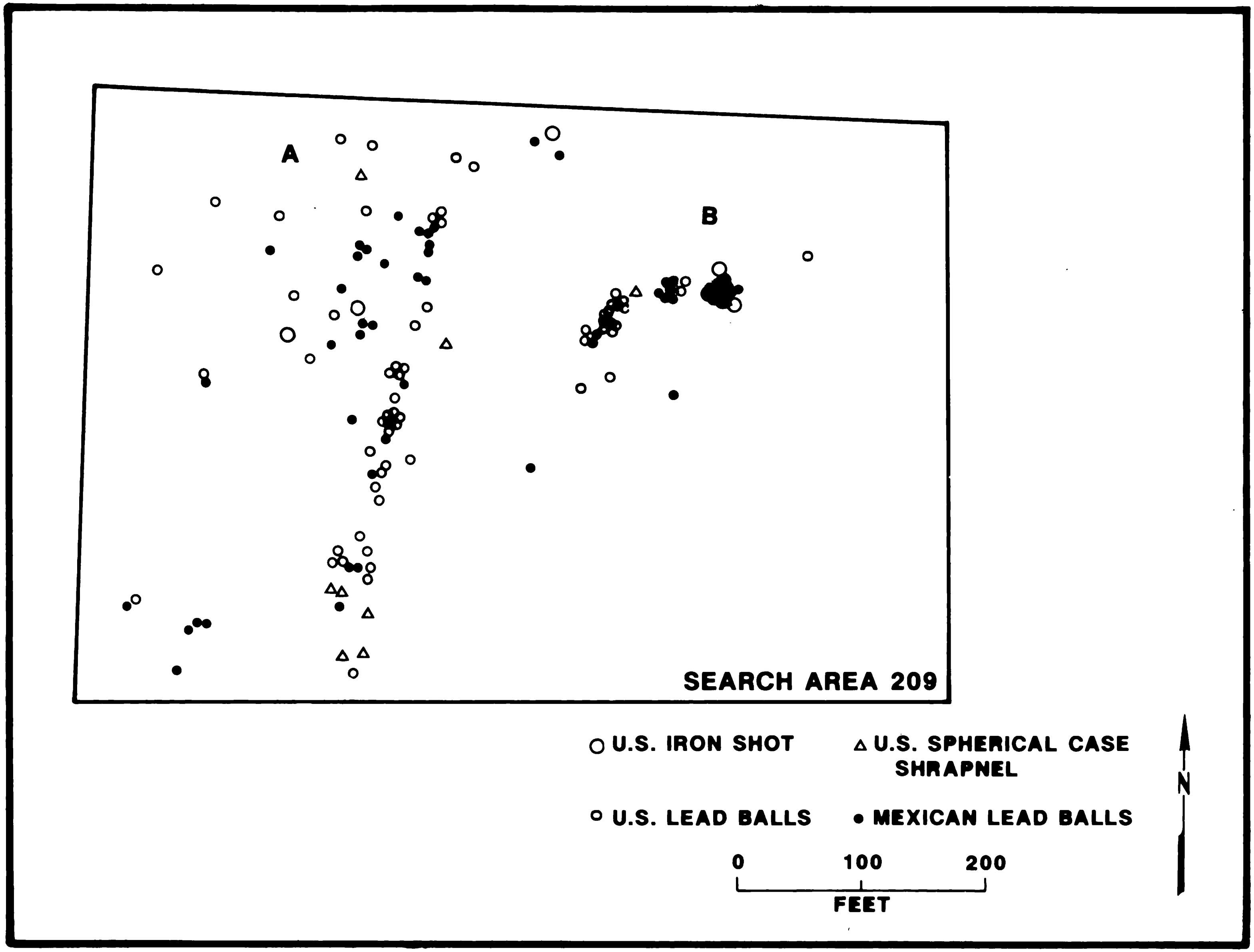

A
B
SEARCH AREA 209
○ U.S. IRON SHOT
△ U.S. SPHERICAL CASE SHRAPNEL
○ U.S. LEAD BALLS
● MEXICAN LEAD BALLS
0
100
200
FEET
N

Figure 43. Lead ball patterning within SA 209.

Other search areas within this portion of the battlefield (SAs 200-208 and 211) yielded 173 Mexican and 29 U.S. lead balls; most of the latter are faceted as expected for lead shrapnel. Yet, unlike Area A within SA 209, the U.S. lead balls occurred more or less in a widespread pattern. In fact, a spherical case round exploding in mid-air, and preferably just overhead and in front of the target, results in a 250 yd diameter spread of shrapnel when the round is fired at point-blank range (Haythornthwaite 1979:60). Therefore, the widespread patternings of lead balls that occurred within SAs 200-208 were the result of overhead ordnance explosions.

Several Mexican lead balls from the above SAs also are faceted or flattened. However, most of Mexican lead balls are round and occurred primarily within three, relatively dense concentrations (Figure 41, pocket insert, SAs 201, 203 and 211). Once again, these concentrations probably were the result of dropping cartridges and/or loose lead balls.

Finally, the following lead balls found within this area of the Mexican battle line are worthy of special note: a .30 caliber ball (i, Figure 42); a .52 caliber ball (h, Figure 42); and a .68 caliber ball with teeth marks (f, Figure 42). The .30 caliber ball is appropriate for U.S. buckshot use in buck-and-ball rounds. However, U.S. infantrymen presumably never came within effective musket range, that is, 100 yd of the Mexican center. It is possible this projectile came from a small caliber, nonregulation pocket pistol.

The .52 caliber ball is appropriate for Hall rifles and carbines used by U.S. skirmishers and dragoons, respectively.

Unlike all the other lead balls, the one with teeth marks possesses a certain poignancy. Bitten and chewed musket balls are occasionally found in period military encampments. Several such bullets were found on a Revolutionary War site, its discoverer theorizing they "were given to culprits in the army that they might chew them to ease their agony while being flogged" (Calver 1950:76). This particular lead ball, of Mexican caliber and found on the Mexican battle line, may well have been bitten by a wounded Mexican soldier while he received some medical attention, or chewed on it to relieve tension.

Lead balls also were found in the following battlefield areas (Figure 3, pocket insert): the area bisected by the Matamoros/Point Isabel Road (Area B); near the western edge of the resaca (Area C); alongside the marshy area that existed between the two battle lines (Area F); and the eastern half of the battlefield, bounded to the south and east by chaparral-covered low rises and dunal ridges (Areas E and G, respectively).

Only 5 U.S. and 4 Mexican lead balls were recovered from Area A, the portion of the battlefield largely, if not exclusively, occupied by U.S. troops. The paucity of lead balls from this area was appropriate since the U.S. army incurred only a few casualties from Mexican firearms; and, since the Americans occupied this area, evidence of spherical case rounds should be minimal here. Some or all of the U.S. lead balls may have been the result of a prematurely exploded spherical case round(s). In fact, several spherical case fragments were recovered from this area. In addition, U.S. troops may have lost some cartridges here during the battle. The presence of Mexican lead balls in Area A may have been the result of their failed attacks on the U.S. right flank. One of the Mexican lead balls recovered from Area A is a .62 caliber, indicating it was fired or dropped by a Mexican rifleman.

One .70 caliber Mexican lead ball was found on the west side of the resaca, within SA 100. Its caliber and location is suggestive of deposition resulting from General Torrejón's initial flanking attacks that occurred in this vicinity of the battlefield.

Nineteen lead balls, 12 U.S. and 7 Mexican, were found along the southeastern perimeter of Area F. Their deposition shows the possible presence of Mexican soldiers here. U.S. lead balls from this area are all flattened or faceted, the result of musket fire or spherical case rounds directed at the Mexicans. All but one of the Mexican lead balls are round, suggestive of cartridge loss.

The 1992 and 1993 surveys recovered 23 lead balls from SAs 300-315, in the eastern half of the battlefield. Of these lead balls, 20 are calibers identified as Mexican, the remaining three are U.S. Also, in 1990, relic hunters collected at least another 65 lead balls from this area (Plitt 1992). The exact proveniences, calibers and other physical attributes were not monitored by those conducting this survey. Therefore, this body of data cannot be incorporated exactly with the 1992-1993 lead ball data.

Other lead balls recovered from this portion of the battlefield include: 1) a .54 caliber conoidal, flat-based bullet (b, Figure 42); 2) a .58 caliber Minié-type bullet (a, Figure 42); and 3) two, .62 caliber balls (c, Figure 42). Conceivably, the .54 caliber bullet was deposited at the time of battle since in 1842 the U.S. Army began experimenting with variously shaped firearm projectiles. Conoidal bullets were specifically tested with the Model 1841 percussion rifle that used a .54 caliber projectile (Lewis 1960:115-116). Although U.S. regulars were not armed with this rifle, some of the Texas volunteers present at Palo Alto may have owned them and consequently fired conoidal bullets.

The .58 caliber Minié-type bullet was adopted by the U.S. Army in 1855 (Records of the Office of the Chief of Ordnance 1855); therefore, this type of bullet definitely post-dates Palo Alto. Mexican sharpshooters would have been armed with the British Baker rifle, which used a .62 caliber ball.

Finally, comparative analyses of lead ball attributes shows general trends concerning the variable methods and standards for the manufacture of lead balls. The following data is pertinent to lead balls intended for standard musket types used by the Mexican and U.S. armies; it does not include data from the six lead balls with .30, .52, .54 and .62 calibers.

Of the total 70 U.S. lead balls, two have both sprue and mold seams and three have mold seams only; therefore, seven percent of U.S. lead balls are out-of-round. Of the 289 Mexican lead balls, 70 are out-of-round due to sprues and mold seams. Two additional lead balls are inadequately cast, possibly due to a cold mold. Thus, 40 percent of all Mexican lead balls are out-of-round.

Sixty-three American lead balls are flattened or faceted. Therefore, caliber ranges could only be determined from the remaining seven, undamaged balls. Of these, six are .65 caliber, one is .64 caliber. Weight ranges for 93 percent of U.S. lead balls are between .82-.87 oz, or a variance of .05 oz. If one includes all U.S. lead balls, weight variance becomes .13 oz. In contrast, Mexican lead balls are within ranges of .680-.770 calibers, .9 calibers in variance, with corresponding weight ranges between .94-1.31 oz, a variance of .36 oz. These ranges are far greater than what was noted for British-made, Revolutionary War-era lead balls that ranged between .687-.700 calibers (Calver 1928:120).

Of the total 289 Mexican lead balls, 23 (8 percent) have calibers greater than .730; these lead balls would have been difficult to ram down the barrel of a correctly bored, .75 caliber India Pattern musket, and they could not be used at all if the musket barrel itself had an incorrect bore of less than .750 caliber. As previously noted, Babits and Manesto (1994) found that approximately 5 percent of the Minié balls recorded from several Civil War battlefields were discarded on the battle line because they were misshapened or too large for the barrel. It would appear that, at least at Palo Alto, the potential Mexican musket ball discard rate is significantly greater than the U.S. Civil War discard rate.

Finally, significant numbers of out-of-round lead balls also support stated hypotheses regarding Mexican methods of lead ball manufacture, including their corresponding lack of quality control.

The above data indicates most U.S. musket balls varied little in caliber and weight. Surprisingly, a few measurable lead balls are .65 caliber; this caliber supposedly was not adopted until after the Mexican-American War. The presence of U.S. molded lead balls reflects the use of ordnance manufactured before arsenals changed over to the swage method. Since Palo Alto was the first battle of the Mexican-American War, very likely ordnance manufactured before the 1846 changeover would have been present, to some extent, in Taylor's command. Yet, at least one spherical case round contained swage-manufactured lead balls--those that had been in linear distribution within SA 209 all lack mold seams and sprues, as well as all falling within a tight weight range of 23.4-24.1 grams.

Spherical Case and Shell

A total of 43 iron fragments of shell and spherical case were recovered (j,k, Figure 44). Analyses of this artifact type included a thickness measurement since thickness primarily determines explosive round type and, secondarily, its poundage. The following information is from Gibbon (1860:Appendix, p. 27):

18-pounder spherical case round wall thickness--.47-.52 in
18-pounder shell wall thickness------------------------.86-.94 "

12-pounder spherical case round wall thickness--.42-.47 "
12-pounder shell wall thickness------------------------.66-.74 "

6-pounder spherical case round wall thickness----.33-.38 "
(A 6-pounder shell was not manufactured).

The arc of an explosive ordnance fragment was monitored to best determine poundage. This was needed since there is some thickness overlap for 12- and 18-pounder spherical case rounds, .47 in, as well as some post-explosion expansion of the fragment due to salt absorption. Arc of a fragment was compared with arcs of three circles having diameters of 5.17, 4.52 and 3.58 in; these are the diameters of 18-, 12- and 6-pounders, respectively (Gibbon 1860:Appendix, p.27).

Using the above parameters, ordnance fragments were identified as follows:

18-pounder spherical case-----10 examples (j, Figure 44)
18-pounder shell--------------------5 "

12-pounder spherical case-------1 "
12-pounder shell--------------------9 " (k, Figure 44)

6-pounder spherical case---------1 "
undetermined-----------------------17 "

The presence of 12-pounder ordnance is especially significant since some sources (Meade 1913:79; Dillon 1975:23) state Duncan's and Ringgold's batteries consisted exclusively of 6-pounders, a conclusion presumably based on reliable documents. One such document may have been Lieutenant Scarritt's letter dated May 12, 1846. In this letter he states that, for defense of the wagon train the day after battle, "...the 12-pdrs. on truck carriages were got out of the waggons [sic] and placed at my disposal" (Scarritt 1846). Also, in his history of the battle, Wilcox (1892:60) noted "The trains

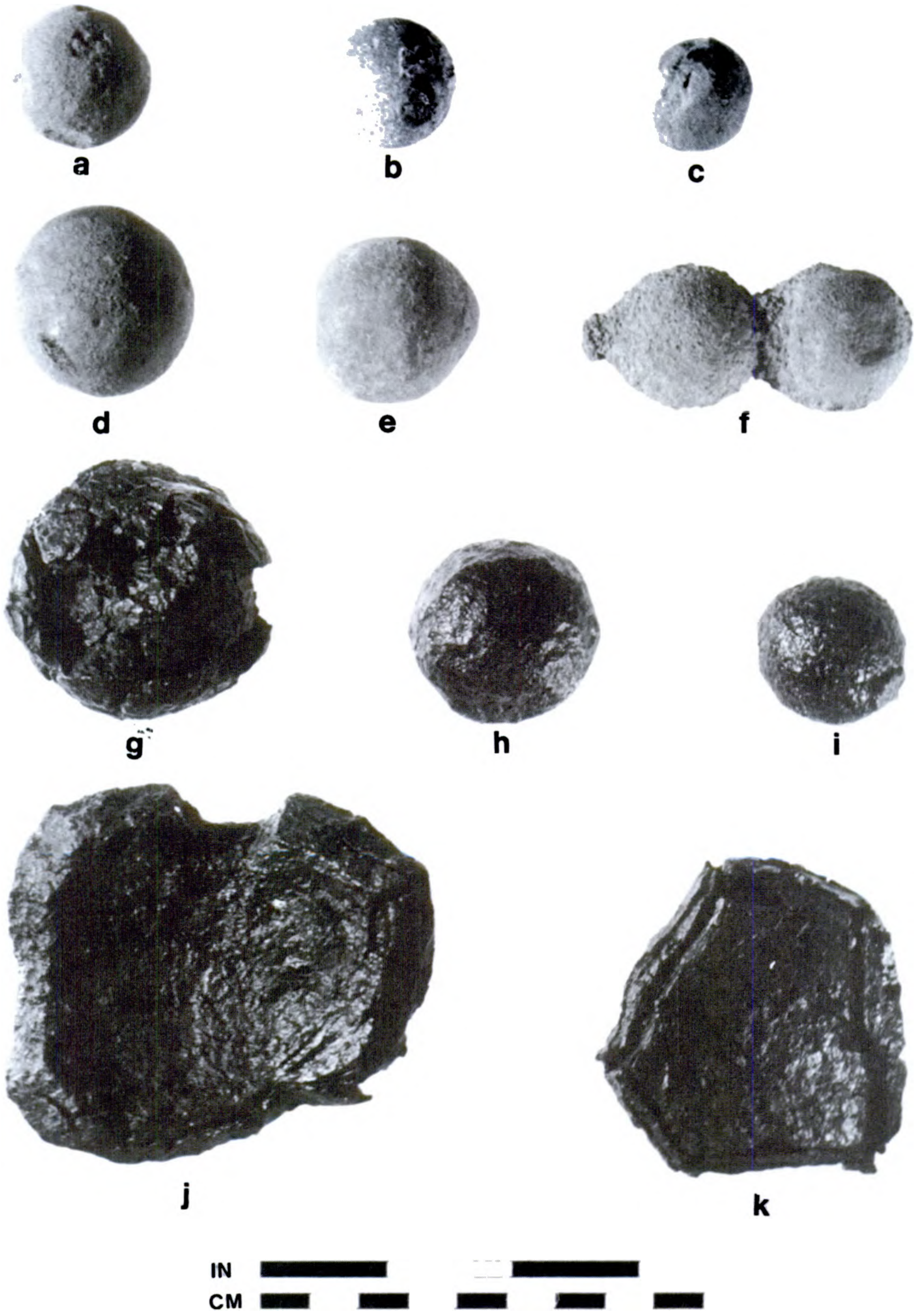


Figure 44. Cannon shot and shell fragments. a,b: Mexican copper shot, 1.05, 1.0 in dia; c: Mexican lead shot, .95 in dia; d,e: Mexican copper shot, 1.3, 1.25 in dia; f: copper shot joined by sprue; g: U.S. iron grapeshot, from 18-pounder; h: U.S. iron shot, from 6-pounder gun; i: U.S. iron shot, from 12-pounder field howitzer; j: 18-pounder spherical case shell fragment (note portion of fuse hole); k: 12-pounder shell fragment.

of Taylor remained during the 9th parked as on the 8th; with them were four guns, the two 18-pounders that had rendered such good service the previous day, **and the two 12-pounders that had not been used**" [emphasis added].

The above information seems to indicate 12-pounders played no active role during the battle. However, in a letter he wrote shortly after the battle, Ulysses S. Grant said the Americans, in addition to the 18-pounders, had "three or four 12-pounder howitzers and four or five 6-pounder howitzers" (Grant 1885:94) (Grant was mistaken in calling the 6-pounder "howitzers"; they were guns).

Assuming Grant's memory was correct, his statement indicates one or two others existed besides the two 12-pounders Scarritt used the day after the battle. Possibly Scarritt was referring to 12-pounder siege guns, a much heavier class of cannon than the lighter, mobile 12-pounder field howitzers. Siege guns normally travelled with an army's supply train and required draft oxen or mules with civilian drivers (Dillon 1975:12). Since presumably the two 12-pounder siege guns were already with the train, they logically would have been incorporated into its defense along with the two 18-pounders used the previous day.

Inside Cullum Hall at West Point are 15 cannon barrels used in the Mexican-American War. On the first floor and mounted onto the wall are seven barrels from Mexican artillery pieces captured at Resaca de la Palma. On the stairway wall leading to the second floor are cannon barrels belonging to the batteries of Captain James Duncan and Major Samuel Ringgold. All four of Ringgold's cannon barrels are 6-pounder guns; Duncan's barrels consist of three 6-pounder guns and one 12-pounder howitzer (Neil Mangum, personal communication 1992). Conceivably this latter fieldpiece was added to Duncan's battery later in the war; however, archeological evidence indicates a 12-pounder was used at Palo Alto.

Ordnance fragments were found within the following areas of the battlefield: Area B, the Matamoros-Point Isabel Road Segment; west of Area C, the resaca; the major portion of the Mexican battle line, situated east of Area A up to the low rises or *motitas* of Area E; and the eastern portion of the battlefield, north of Area F (Figure 3).

Four fragments were found in Area B: one 12-pounder spherical case; two 18-pounder spherical case; and one unidentified fragment. Since this area of the battlefield was largely occupied by U.S. forces, appropriately relatively few U.S. ordnance fragments were found here. A possible explanation for their presence is premature midair detonation, an event that frequently occurred with nineteenth century explosive ordnance (Haythornthwaite 1979:60).

Three fragments were found west of Area C: two identified as 18-pounder spherical case; and one from a 6-pounder spherical case. These fragments may reflect U.S. defensive use of cannon to turn back Mexican flanking attempts in this area of the battlefield. During this action, the left flank of the U.S. Fifth Infantry was protected by two 6-pounders that fired antipersonnel rounds (McIntosh 1846:2). The presence of 18-pounder spherical case fragments is suggestive these heavier cannon contributed to flank defense as well.

Sampling of the Mexican battle line produced 22 18-pounder spherical case and shell fragments as well as 12-pounder shell fragments (j,k, Figure 44). These ordnance fragments were found both widely scattered and in relative concentrations. A wide scattering of ordnance fragments is the probable result of midair ordnance detonation, with concentrations occurring as the result of ground detonation. Not surprisingly, spherical case fragments were found intermixed with concentrations of U.S. lead ball shrapnel.

All four ordnance fragments found in the eastern portion of the battlefield are of widely scattered 12-pounder shell. These remnants probably reflect Duncan's successful defense of the U.S. left flank toward the end of the battle.

U.S. Iron Shot

Following terminology of nineteenth century ordnance manuals, "shot" refers to the metal ball shrapnel that filled canister. Shot should not be confused with "grapeshot", the latter term reserved by artillerymen of the period to describe larger diameter iron balls fired in clusters of nine.

The following canister shot dimensions from Gibbon (1860:Appendix, p.29) provided the basis for identifying U.S. shot:

6-pounder gun, shot, large gauge diameter-------------------- 1.17 in (h, Figure 44)
6-pounder gun, shot, small gauge diameter------------------- 1.14 "

12-pounder howitzer, shot, large gauge diameter----------- 1.08 "
12-pounder howitzer, shot, small gauge diameter---------- 1.05 " (i, Figure 44)

18-pounder grapeshot, large gauge diameter----------------- 2.46 "
18-pounder grapeshot, small gauge diameter---------------- 2.36 " (g, Figure 44)

A total of 167 iron shot and 3 grapeshot were recovered. Of these, 86 (51 percent) either have all or a sufficient amount of their original surface to allow for accurate gauging. The remaining 84 (49 percent) are now missing their entire original surfaces due to exfoliation. An exfoliated artifact, therefore, was assigned to its proximate, larger-sized gauge category. For example, an exfoliated shot with a diameter of 1.37 inches after conservation would be identified as an 18-pounder shot, that is, within the range of 1.67-1.70 in. Of course, since actual amounts of exfoliation cannot be quantified, error in gauge determinations may have occurred. Fortunately, when exfoliated shot are factored out, a significant shift in percentages distribution of shot gauges does not occur.

By far, the greatest concentration of iron shot occurred within the eastern side of Area F, the marshy area between the battle lines (Figures 3 and 41). A metal detector sweep of this area resulted in a noncollection recording of 110 shot. This represents 65 percent of all iron shot recorded. Presumably due to relatively moist conditions within Area F, over 70 percent of these shot are moderately to severely exfoliated; in fact, several are little more than iron crumbs that could not be measured, only provenienced. Diameters of the measurable shot indicate these all came from canister fired from 6-pounder cannon. The overall shot patterning suggests Mexican troops massed to the south and east of the marsh barrier, providing a tempting target for U.S. light batteries.

In contrast, 10 of the 13 shot found on the Mexican battle line south of Area F came from 18-pounder canister. This pattern possibly reflects a U.S. artillery tactic practiced during the battle, that is, using the greater range of the 18-pounders to destroy Mexican troop concentrations beyond normal reach of U.S. light batteries, freeing the latter to concentrate on frontline troops such as those adjacent to the marshy area located between the opposing battle lines.

A total of 30 U.S. shot and two grapeshot were found in Area B. This shot represents all three sizes of U.S. cannon used at Palo Alto. Figure 41 shows the overall patterning of this ordnance, which appears to increase in number as one approaches the southern and western limits of Area F. Given its location on the battlefield, it is possible deposition occurred largely as a result of an attempted

Mexican cavalry attack towards the end of the battle to destroy the 18-pounders. If this is correct, the cavalry units probably originated from an area of the battlefield to the south and west of Area F. To repel this attack, the 18-pounder battery had to reposition itself, the maneuver accomplished just in time to discharge antipersonnel rounds into the oncoming cavalry. In his account of the battle, Taylor (1846:3) mentioned only the Artillery Battalion in support of the 18-pounder battery during this attack; the archeological evidence is suggestive that U.S. light artillery fieldpieces provided some additional support.

Nine shot and one grapeshot were recovered from the eastern portion of the battlefield. All but 2 of the 10 ball shrapnel are the 18-pounder size, and most were north of "Arista Hill" (Figure 41). The presence of U.S. ordnance here, in association with Mexican-related accouterments, such as uniform brass and gun parts, provides additional data for the hypothesis that 18-pounders concentrated on Mexican troops beyond the reach of U.S. light artillery. Negative information supporting this hypothesis is the comparative scarcity of U.S. ordnance from light artillery within this area of the battlefield.

The 1841 Ordnance Manual required grapeshot be used only by naval, seacoast and siege guns (Peterson 1969:107). Thus, one should not expect to find U.S. grapeshot on post-1841 battlefields. Yet three iron balls of 2.10, 2.15 and 2.20 in diameters were recovered. One each of these iron balls was found in SA 6, Area B; SA 200, on the Mexican battle line; and SA 308, on the eastern portion of the battlefield (g, Figure 44). Using the above-described method of assigning ordnance, these are small gauge 18-pounder grapeshot. An explanation for their presence is that 18-pounders, in their dual capacity as seacoast artillery, may have had stands of grapeshot in their munition chests. Conceivably grapeshot was used on occasion during the battle due to supply exhaustion and conservation of spherical case, shell and canister.

Mexican Cupreous and Lead Shot

A total of 59 cupreous and four lead shot were recovered (examples: a-f, Figure 44). Cupreous shot is Mexican in origin since several accounts (e.g., Furber 1848: 199) note the predominant use of copper or copper alloyed metal by Mexican manufacturers of cannon ammunition. Lead shot found on the battlefield also presumably is Mexican since: only iron is mentioned for the manufacture of U.S. shot; the diameters of the lead shot correspond with diameters of the copper shot; and the lead shot display other distinguishing characteristics similar to some of the recovered copper shot.

Mexican shot served the same function as its U.S. counterpart; its container, however, could differ. In addition to the cylindrical tin canisters used by the U.S., Mexican shot also could be packaged in cloth bags or rawhide, the latter dried to shrink tightly around its contents.

Based on their diameters, there are 10 groupings of Mexican shot. Their diameters, in inches, are as follows: .85, .90, .95, 1.0, 1.05, 1.12, 1.25, 1.30, 1.35 and 1.45. The greatest concentration of copper shot occurred primarily to the east and northeast of Area F, and all but the 1.45 in diameter-size shot are represented in this area. The presence of Mexican shot here may reflect the Mexican response to Captain May's dragoon attack on the Mexican left flank. May described this action as follows:

> About half an hour before sunset I received orders to proceed to the enemy's left flank, and drive in his cavalry. In execution of these orders...the enemy concentrated the fire from his batteries upon us, killing six of my horses and wounding five men. I succeeded in gaining a position on the enemy's left, with a view of charging his

> cavalry, but found him in such a force as to render ineffectual a charge from my small command...(Taylor 1846:21,22).

Colonel McIntosh, commander of the Fifth Infantry, describes May's attack toward the end of the battle as follows:

> While in this position [held by the Fifth Infantry] a cannon shot struck into a squadron of Dragoons **moving through a marsh in front of us** [emphasis added], killing some horses and disabling one man (McIntosh 1846).

Toward the end of the battle the U.S. Fifth Infantry was facing an easterly direction roughly parallel with the wagon road. Taking this new position into account, the above-mentioned marshy area probably was Area F. Movement of May's squadron through Area F implies the Mexican left flank, by this time, was anchored on the southwestern side of this natural feature (Figures 3 and 41). It is, therefore, plausible Mexican copper shot found west and north of Area F is the above "cannon shot" described by Colonel McIntosh.

The physical characteristics of Mexican shot are suggestive of at least four different manufacturing sources for this type of ordnance: some of the balls are almost egg-shaped and pitted, with the sprues partially intact; some are faceted due to filing off of the sprue and other out-of-round imperfections; mold seams are strongly evident on others; and a few are almost perfectly spherical with a relatively smooth surface. One of the shot indicates the method of manufacture (f, Figure 44). It consists of two shot joined by their shared channel sprue, a result of nonseparation of the shot from a gang mold.

Four lead shot, all with diameters between 1.0-1.03 in, were found on the Mexican battle line. Lead shot presumably are Mexican in origin due to physical characteristics shared with some of the cupreous balls, such as slight nonalignment of ball hemispheres due to a shot mold in need of repair (c, Figure 44).

Solid Shot/Cannon Balls

Although "solid shot" is the correct nineteenth century technical term for this ordnance (Mordecai 1849; Gibbon 1860), the more popular term "cannon ball" will be used in the following discussion. Hopefully this will avoid its confusion with the much smaller ball shrapnel "shot" ordnance.

A total of 11 iron and 4 cupreous cannon balls were recovered (Figure 45). One iron cannon ball was located on the surface. Its diameter of 3.50 in was measured in the field but not collected or weighed at the request of the landowner. The following cannon ball measurements are stated in English inches and pounds, as was the common practice for muzzle-loading artillery:

Iron Cannon Balls

FS 332	SA 303	3.54	in	dia.	4.50	lbs	
FS 333	SA 303	3.60	"	"	2.89	"	
FS 357	SA 202	3.90	"	"	4.75	"	
FS 421	SA 306	3.50	"	"	3.70	"	
FS 422	SA 308	3.66	"	"	6.50	"	
FS 423	SA 308	3.50	"	"	4.60	"	(a, Figure 45)
FS 424	SA 308	3.48	"	"	4.25	"	
FS 426	SA 310	3.30	"	"	4.40	"	
FS 434	SA 309	3.50	"	"	4.50	"	

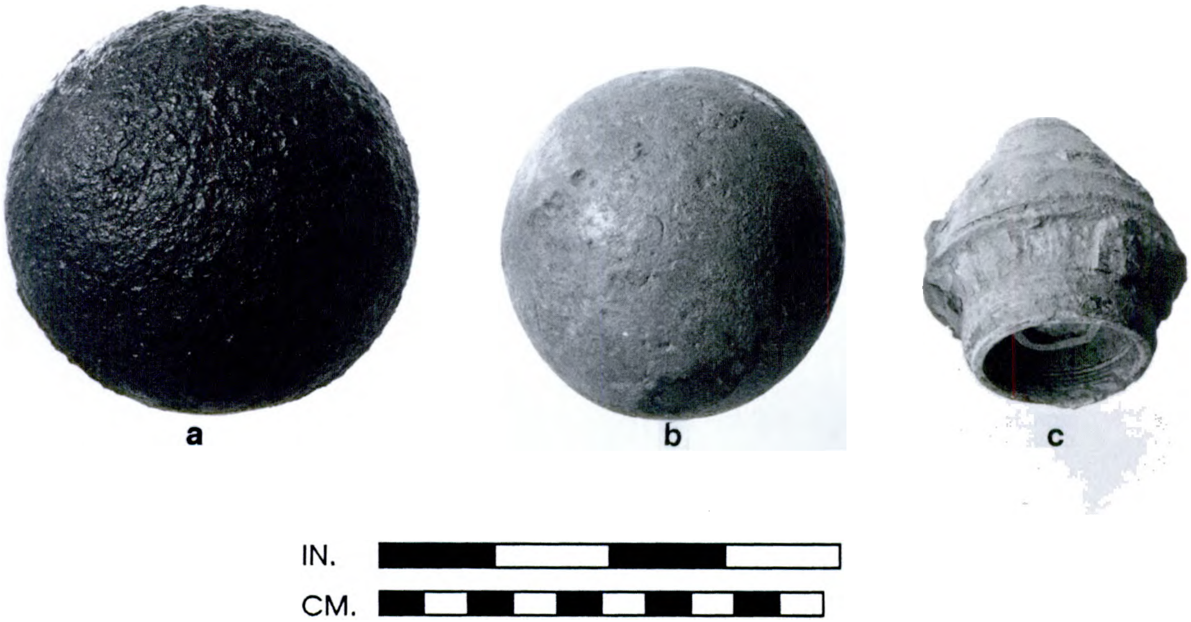


Figure 45. Cannon balls. a: U.S. 6-pounder iron cannon ball; b: Mexican 4-pounder cupreous cannon ball; c: aluminum alloy nose fuse from a Model 1897 cannon round.

Iron Cannon Balls (continued)

FS 456	SA 311	3.85 "	"	5.90 "	
FS 853	SA 305	4.17 "	"	8.80 "	

Cupreous Cannon Balls

FS 420	SA 307	3.10 in	dia.	4.75 lbs	(b, Figure 45)
FS 425	SA 308	3.10 "	"	4.75 "	
FS 437	SA 309	3.20 "	"	4.75 "	
FS 854	SA 305	3.25 "	"	5.00 "	

Notably, exfoliation and swelling occurred on most of the iron cannon balls in varying degrees. Therefore, these measurements do not correspond closely with their original diameters and weights as do the cupreous cannon balls. Unlike iron cannon balls, measurements of cupreous cannon balls presumably are closely approximate to the original diameters and weights since they exhibit virtually no deterioration due to oxidation.

According to Gibbon (1860:Appendix, p.27), cannon balls for U.S. 6-pounders were 3.58 in diameter and weighed 6.16 lbs; 12-pounder field howitzer cannon balls were 4.52 in diameter and weighed 12.30 lbs. None of the recovered cannon balls apparently were fired by a 12-pounder howitzer. However, measurements of a few of the iron cannon balls, for example, FS 422 and 385, come relatively close to what is appropriate for U.S. 6-pounders.

As previously noted, seven Mexican cannon tubes captured at Resaca de la Palma are on display at West Point Military Academy. Five of the seven tubes have a bore of 3.50 in and one has a bore of 4.25 in. The bore of the seventh tube cannot be measured since it is imbedded in the wall. Two of these tubes are inscribed with the date of 1767 and one with 1774; the other four appear to be of the same pre-*Gribeauval* pattern, and thus, they, too, date to the eighteenth century (Neil Mangum, personal communication 1992).

Brass cannon tubes made during the latter half of the eighteenth century have a windage difference averaging around .20 in (Peterson 1969:41). Therefore, the above-described cupreous cannon balls were likely fired from those tubes with a bore diameter of 3.50 in. In light of this, the iron cannon ball FS 853 was conceivably fired from the same Mexican cannon tube at West Point that has a bore of 4.25 in.

Unfortunately, identification of the national origin of most of the iron cannon balls is not possible with absolute assurance because of exfoliation and swelling. Yet, there was a general clustering of cannon balls, both cupreous and iron, toward the northern ends of SAs 303, 306-309 (Figure 41). This pattern, combined with the nearby presence of a few U.S.-related accouterments such as a cartridge belt plate, canteen spout and a spur buckle, is suggestive that these cannon balls were largely fired from Mexican cannon in their attempt to destroy Duncan's battery.

Firearm Parts

All of the recovered firearm parts came from the Mexican battle line and primarily represent the India Pattern musket (Figure 46; see also Figure 16, India Pattern Musket). Also present is a part from a British Paget carbine.

1) Pistol Butt Cap(?) (a, Figure 46)
One example: FS 577 SA 209 1.0 x .91 in .06 oz

Description: Concave disc; whole; hammered copper; ovoid; has a center hole that was crudely cut/punched out--if for a pistol, this allowed for attachment of object by a screw to the butt of a pistol; found on the Mexican battle line. The artifact was made by cutting out an ovoid piece from copper sheet, then formed into its concave shape by hammering; unskilled, homemade manufacture.

2) Trigger Guard Upper Finial (b, Figure 46; d, Figure 47)
One example: FS 766 SA 212 1.2 in long .30 oz

Description: Cast and filed brass; fragment; from Mexican battle line; finial has the simplified design indicative of the Indian Pattern musket (Darling 1981:49, Figure 40).

3) Trigger Guard (fragment) (c, Figure 46; c, Figure 47)
One example: FS 289 SA 202 .98 in long .32 oz

Description: Cast and filed brass; fragment; from Mexican battle line (SA 202). The artifact has a portion of a countersunk screw hole adjacent to the trigger guard bow, which is typical of an India Pattern musket (Darling 1981:49, Figure 40).

4) Spring Attachment(?) (d, Figure 46)
One example: FS 595 SA 211 1.4 x .08 in .17 oz

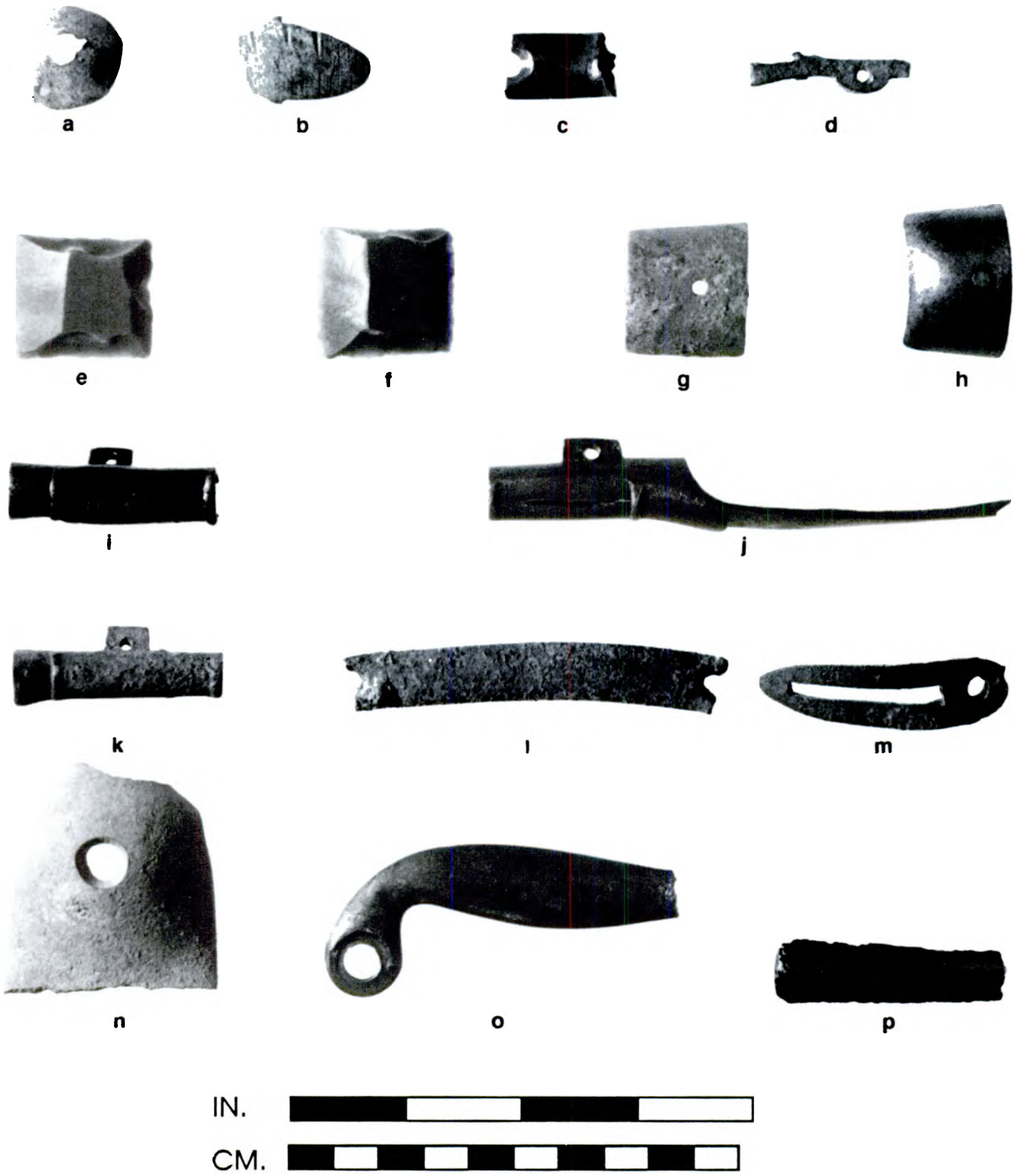


Figure 46. Firearm parts. a: pistol butt cap (?); b: trigger guard upper finial; c: trigger guard; d: spring attachment (?); e,f: gunflints; g: musket nose cap; h: carbine nose cap; i: second ramrod pipe; j: terminal ramrod pipe; k: second ramrod pipe; l: trigger guard tail, fragment; m: trigger plate; n: butt plate fragment; o: side plate; p: bayonet blade, fragment.

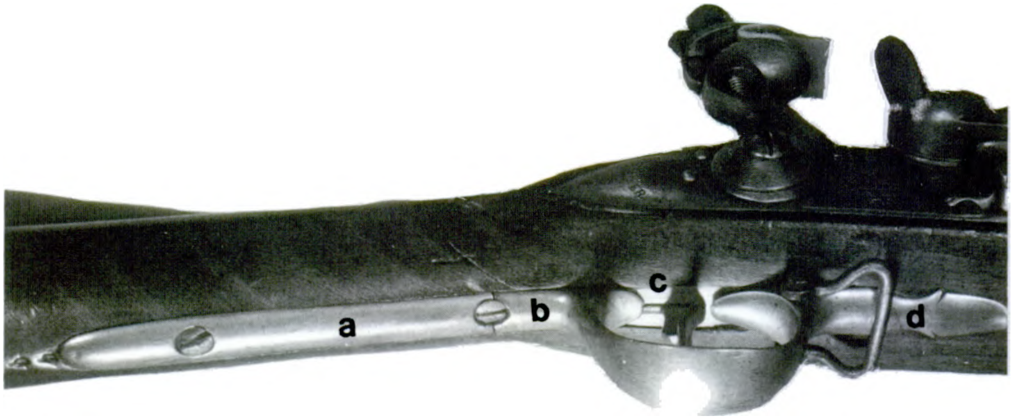


Figure 47. Trigger guard parts of an India Pattern musket. a: trigger guard tail; b: trigger guard and guard tail; c: trigger plate; d: upper finial. Photo courtesy Samuel Nesmith.

Description: Cast brass; whole. This object, found on the Mexican battle line, may be a spring attachment for a firearm. However, Bill Brown of the National Park Service, Harpers Ferry Design Center, could not identify this artifact on any of the park's collection of period British or American muskets or rifles (personal communication 1993).

5) Gunflints

Two examples:

FS 345	SA 201	1.3 x 1.1 x 0.4 in	.40 oz	(e, Figure 46)
FS 702	SA 211	1.3 x 1.1 x 0.4 in	.40 oz	(f, Figure 46)

Description: Musket gunflints; whole; from the Mexican battle line. Their measurements meet traditional specifications for the British carbine (Peterson 1956:228); however, this size also can be used on a musket (James Moore, personal communication 1993).

FS 345 is gray and opaque with inclusions; FS 702, nearly translucent black. Both variants are present within the flint beds around Brandon, England an area extensively developed for gunflints since around 1790 (Lotbiniere 1980:vii-viii). Physical characteristics of the two artifacts are typical of blade technology gunflints made in England since around 1775, that is, possessing two transverse flake scars, beveled edge, heel trimmed off, cleanly broken sides, and characteristic demi-cones of percussion (Kenmotsu 1990:100). The working edges of both gunflints do not exhibit use wear scars due to firing; however, FS 345 possesses a series of flake scars along its other two sides, suggesting its use as a strike-a-light (James Moore, personal communication 1993).

6) Musket Nose Cap

Two examples:

FS 558	SA 209	.98 x .98 in	.63 oz	(g, Figure 46)
FS 773	SA 209	.87 in long	(width not measurable)	.58 oz

Description: Cast and filed brass; virtually whole; forward end of cap terminates with a flat flange perpendicular to cap length, flange concave to support the barrel; attachment pin hole is off-center; one corner of rear end is broken off; length is slightly tapered with rear end .08 in wider than forward end; from Mexican battle line. Nesmith (personal communication 1993) identifies these as nose caps for the India Pattern musket.

7) Carbine Nose Cap
One example: FS 264 SA 203 2.4 in long .97 oz (h, Figure 46; Figure 48)

Description: Cast and filed brass; whole; bevelled and rounded forward end, brass pin present for attachment to stock, initials on reverse, initials (RH or BH) partially obscured by attachment pin; from Mexican battle line. Nesmith (personal communication 1993) identifies this as part of a Paget carbine, a British firearm normally used by Mexican mounted troops.

8) Second Ramrod Pipes
Two examples:
FS 227 SA 202 1.8 x .47 in 1.1 oz (i, Figure 46; Figure 49)
FS 670 SA 211 1.8 x .47 x .35 in 1.3 oz (k, Figure 46)

Description (FS 227): Cast brass, with bell mouth, ridge, collar and one-piece lug for a barrel pin; whole. The bell mouth has a .47 in diameter, the other end is misshapened due to damage; one side of the pipe is almost entirely missing. This is the second ramrod pipe for an India Pattern musket, as indicated by its in situ placement 7 in from and aligned with a terminal ramrod guide (FS 226), the latter having similar damage.

Description (FS 670): Cast brass, with bell mouth, ridge, collar and one-piece lug for a barrel pin; whole. The bell mouth is .47 in in diameter, the other end .35 in, with an overall length of 1.8 in; found on the Mexican battle line. FS 670 is the second ramrod pipe on an India Pattern British musket. This variety of ramrod pipe was introduced in 1777 by London gunmaker John Pratt and gradually replaced the older type "thimble" pipe. The Pratt ramrod pipe was used in the later Short Land, New Pattern muskets, and all India Pattern muskets (Darling 1981:39). The India Pattern has three pipes; the earlier British muskets, four pipes.

9) Terminal Ramrod Guide Pipe
One example: FS 226 SA 209 4.5 x .47 in 2.1 oz (j, Figure 46; Figure 50)

Description: Cast and filed brass; tapered end; one-piece lug for a barrel pin; one side of the pipe is split; found on the Mexican battle line. This object is the terminal guide for an India Pattern musket, in association with FS 227, second ramrod pipe, same musket.

10) Trigger Guard Tail (fragment) (l, Figure 46; a, Figure 47)
One example: FS 778 SA 212 3.2 in long .53 oz

Description: Cast and filed brass; fragment; from the Mexican battle line; has two countersunk screw holes, one at either end, which is typical for the India Pattern musket (Darling 1981:49, Figure 40).

11) Trigger Plate (m, Figure 46; c, Figure 47)
One example: FS 710 SA 209 2.2 x .59 in .45 oz

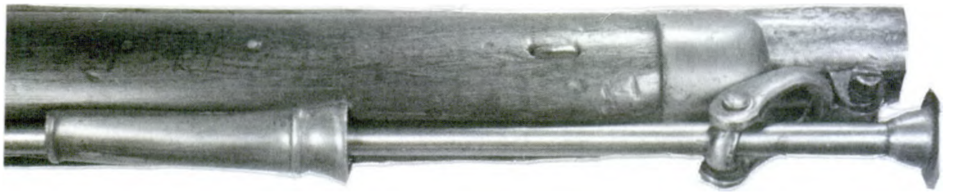


Figure 48. Paget carbine. Note nose cap and ramrod guide. Photo courtesy Samuel Nesmith.

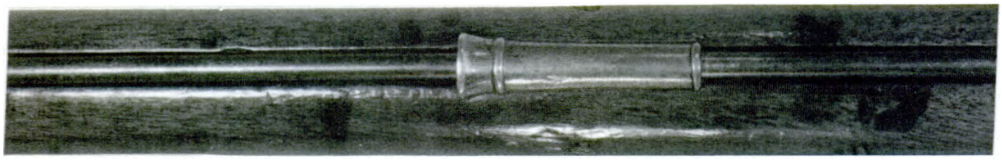


Figure 49. Second pipe, India Pattern musket. Photo courtesy Samuel Nesmith.

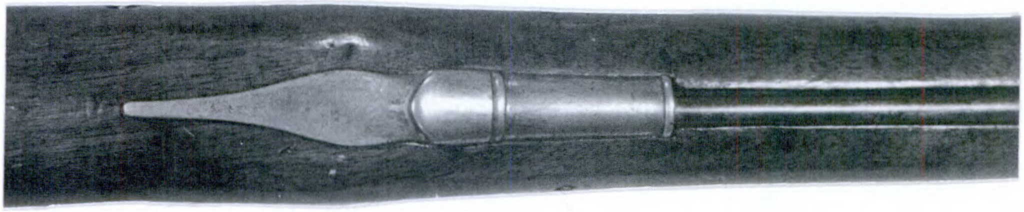


Figure 50. Terminal ramrod pipe, India Pattern musket. Photo courtesy Samuel Nesmith.

Description: Cast and filed brass; whole, bent; has a single internal collar for the barrel screw on the forward part, .25 in high; and a rectangular opening for the trigger; found on the Mexican battle line. A trigger plate of almost identical weight and dimensions was found in the Mexican siege trenches at the Alamo, and identified as part of a pistol or small rifle (Nesmith 1986:83, artifact U-12).

12) Butt Plate (n, Figure 46; Figure 51)
One example: FS 859 SA 499 1.8 in long (fragment) 1.3 oz

Description: Cast, hammered and filed brass; fragment; countersunk screw hole present; found between battle lines. This artifact, from an India Pattern musket, is the concave portion of a butt plate that fits over the toe of the musket stock (Darling 1981:51, fig.42).

13) Side Plate (o, Figure 46; Figure 52)
One example: FS 264 SA 203 2.4 in long (fragment) .97 oz

Description: Cast and filed brass, largely intact, minus the forward screw hole; found on the Mexican battle line. This is the convex plate design used on the India Pattern musket (Darling 1981: 48, Fig.39).

14) Side Plate Terminus
Two examples (not shown):
FS 696 SA 212 1.26 in long (fragment) .25 oz
FS 697 SA 212 1.06 in long (fragment) .22 oz

Description (FS 696): Cast and filed brass; screw hole terminus fragment, with portion of neck; part of an India Pattern musket; from Mexican battle line.

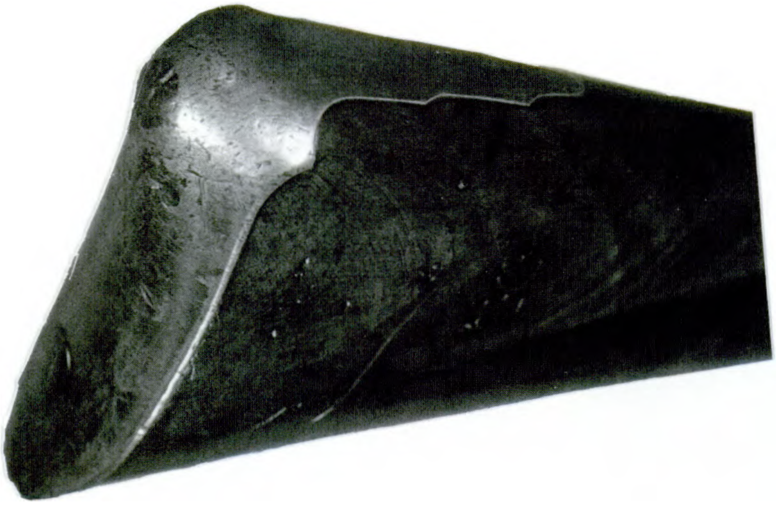


Figure 51. Butt plate, India Pattern Musket. Photo courtesy Samuel Nesmith.

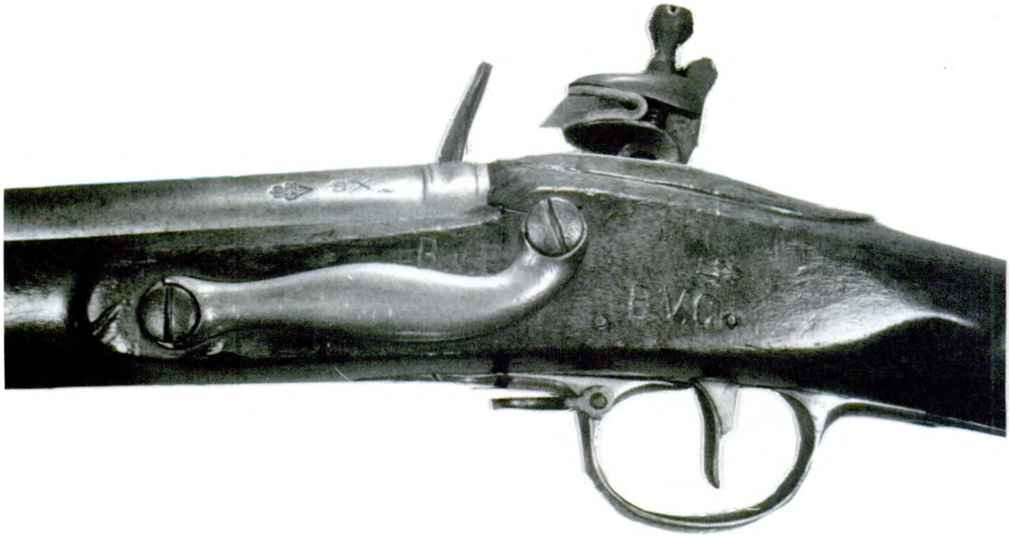


Figure 52. Side plate, India Pattern musket. Photo courtesy Samuel Nesmith.

Description (FS 697): Cast and filed brass; partial; screw hole terminus fragment; part of an India Pattern musket; from Mexican battle line.

Edged Weapons

1) Bayonet Blade (fragment) (p, Figure 46)
One example: FS 56 SA 49 2.2 x .50 x .39 in .25 oz

Description: Wrought iron; fragment; slightly tapered with a rounded median ridge, median ridge slightly grooved on two sides, with flat lower face; from U.S. battle line. The artifact bears some resemblance to the upper blade portion for U.S. bayonet models 1808 and 1816 (McNulty 1973:66, Figure 6, No. 12).

2) Sword Hilt (fragment) (Figures 53, 54)
One example: FS 511 SA 209 5.9 x 1.97 x 1.20 in 7.7 oz

Description: Cast and filed; almost whole; cupreous; hollow; knuckle guard broken off, with graze indentation along one side of handle; from Mexican battle line (SA 209). Nesmith (personal communication 1993) identifies this as a hilt to a short, curved infantry sword called a *briquet*, typically carried by infantrymen in the Mexican Army. The Mexican *briquet* was made in Mexico, its design based on those used by the French Army during the Napoleonic Wars.

Buckles

Eighteen buckles were recovered and grouped into 12 types (Figure 55). Type designation was based on buckle form and, where positive identification was possible, by function. There is a close relationship between form and function for the large U.S. harness buckles (m, Type 10); however, some of the smaller specimen types probably were used on haversacks, belts or small harnesses (a-c, Type 1). All of the Mexican buckles are cupreous; of the four U.S. buckles, two are ferrous (m, Type 10) and two are cupreous (n, Type 11; o, Type 12).

Type 1
Five examples:

FS 699	SA 211	1.3 x 1.0 x .12 in	.33 oz	(a, Figure 55)
FS 801	SA 211	1.1 x .87 x .12 in	.23 oz	(b, Figure 55)
FS 588	SA 209	1.1 x .90 x .12 in	.22 oz	(c, Figure 55)
FS 738	SA 211	1.2 x .90 x .16 in	.26 oz	(not shown)
FS 806	SA 211	1.2 x .90 x .16 in	.25 oz	(not shown)

Description: Single frame buckle; cast and filed brass; whole; plain rectangular, with angular corners; none have tongues or wear on the frames indicative that tongues were ever present; all are from the Mexican battle line. The relatively small dimensions of Type 1 are comparable to the clothing-related buckles found at the Spanish Colonial site of Quiburi in Arizona (Woodward 1953:203). Nesmith (personal communication 1993) suggests the Type 1 buckle was used on the Mexican uniform. In fact, such buckles were found in the excavated Mexican mass burial at Resaca de la Palma; within this mass burial, Type 1 buckles were found on the pelvic region of the skeletal remains (Eric Ratliff, personal communication 1993; also see Appendix B, this report). This position on the pelvis is suggestive that Type 1 buckles were used on Mexican cartridge boxes. Buckles of the same size and dimension as Type 1 were used on late eighteenth-early nineteenth century British cartridge boxes (Neumann and Kravic 1975:79, Figure 48).

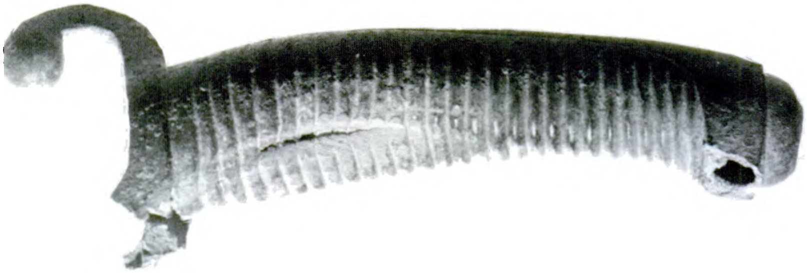


Figure 53. *Briquet* sword hilt, from Mexican battle line.

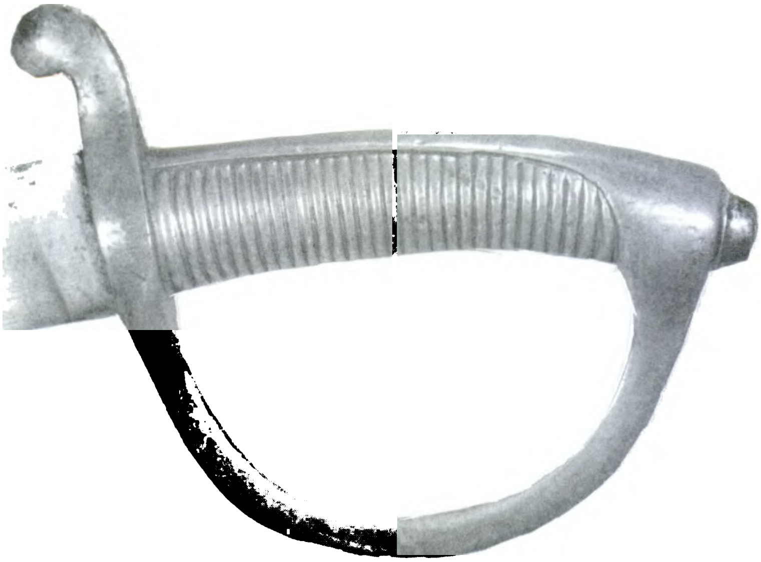


Figure 54. Intact *briquet* sword hilt. Photo courtesy Samuel Nesmith.

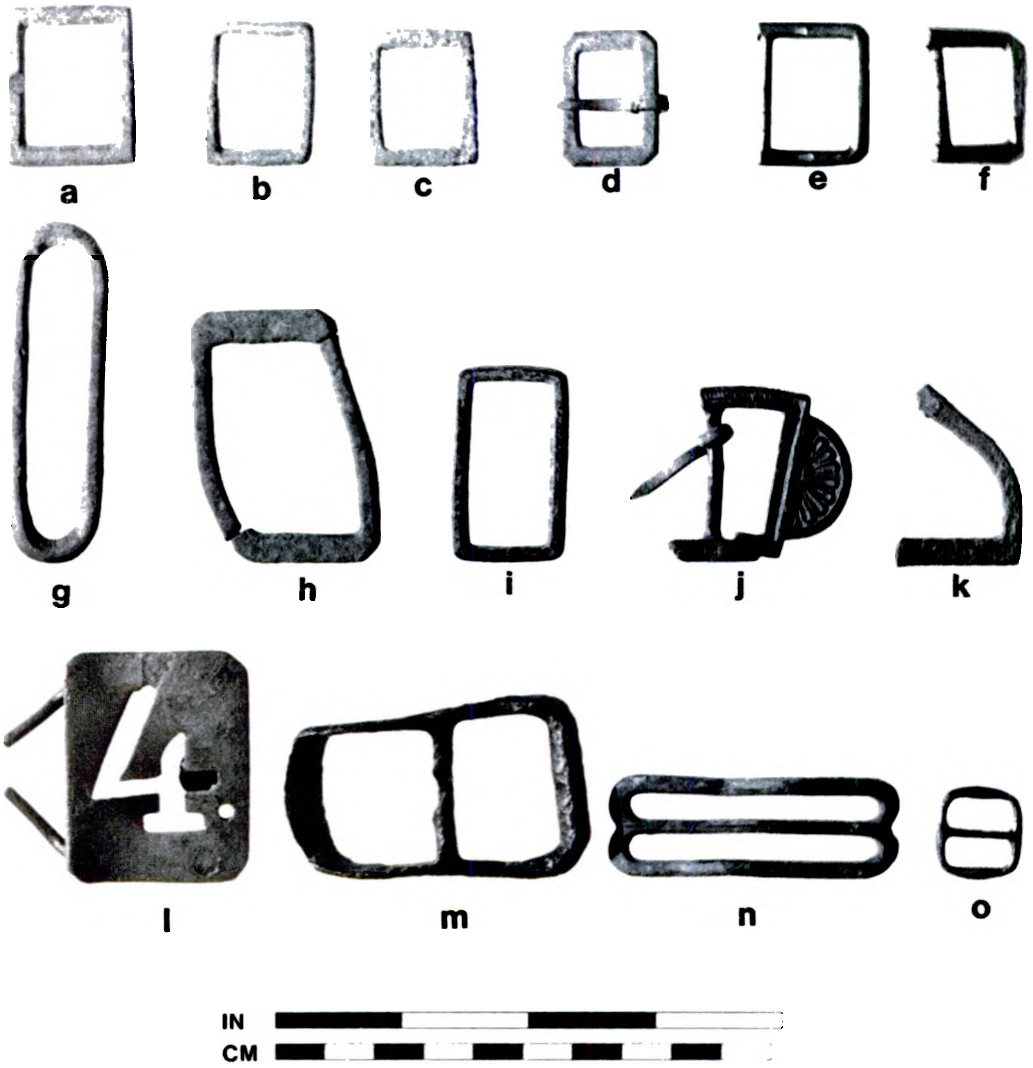


Figure 55. Buckles. a-c: Type 1; d: Type 2; e,f: Type 3; g: Type 4; h: Type 5; i: Type 6; j: Type 7; k: Type 8; 1: Type 9; m: Type 10; n: Type 11; o: Type 12.

Type 2 (d, Figure 55)
One example: FS 583 SA 209 1.06 x .79 x .08 in .22 oz

Description: Single frame buckle; cast and filed brass; whole; plain rectangular, with cut-off corners; tongue is present; from the Mexican battle line. Nesmith (personal communication, 1993) suggests the Type 2 buckle is from a stirrup; a late eighteenth-early nineteenth century iron buckle of similar size and design, but decorated, came from a Spanish Colonial and Mexican period site in New Mexico, and is identified as a stirrup buckle (Simmons and Turley 1980:114, Figure 4).

Type 3
Two examples:
FS 146 SA 16 1.1 x .91 x .12 in (1/2 of buckle) .23 oz (e, Figure 55)
FS 372 SA 208 1.1 x .71 x .12 in (1/2 of buckle) .20 oz (f, Figure 55)

Description: Double frame buckles; cast and filed brass; fragments; plain rectangular; rounded corners; tongue absent and no wear on frames indicative of tongues; FS 146 was found more or less between the two battle lines; FS 372 was from the Mexican battle line. If whole, the Type 3 buckles would have been approximately 1.5- 2.0 in long; this would be comparable in size and design to a harness buckle found at Fort Stanwix, a mid-eighteenth century British fort near Rome, New York (Hanson and Hsu 1975:93, Figure 51r). Woodward (1953:194) illustrates the use of a tongueless double frame buckle (no scale) on a Spanish Colonial bridle.

Type 4
Two examples:
FS 638 SA 211 2.7 x .79 x .16 in .65 oz (g, Figure 55)
FS 654 SA 211 2.6 x .16 in (fragment) .24 oz (not shown)

Description: Single frame buckle; cast brass; plain, elongated oval; no tongue; from Mexican battle line. Nesmith (personal communication 1993) identifies Type 6 as a Mexican buckle, its exact use not known.

Type 5 (h, Figure 54)
One example, consisting of two mendable pieces:
FS#s 643, 656 SA 211 1.8 x 1.2 x.20 in (mended dim.) .71 oz

Description: Single frame buckle; cast brass; plain rectangular, with rounded corners; tongue absent and no wear on frames indicative of a tongue; from the Mexican battle line. Based on its relatively large size, this buckle probably was used on Mexican horse harness.

Type 6 (i, Figure 55)
One example: FS 860 SA 499 1.8 x 1.1 .16 in .30 oz

Description: Single frame buckle; cast and filed brass; whole; plain rectangular, with angular corners; tongue absent and no wear on frames indicative of a tongue; from the Mexican battle line. Based on its relatively large size, FS 860 probably was used on Mexican horse harness.

Type 7 (fragment) (j, Figure 55)
One example: FS 653 SA 211 1.6 x 1.3 x .08 in .38 oz

Description: Double frame buckle; cast and molded decoration; brass; fragment; tongue present; one of the frame bars is missing, one side broken apart and bent; molded half-rosette decoration on belt support flange and stamped line rouletting on the frames; from the Mexican battle line. Nesmith (personal communication 1993) identifies FS 653 as an officer's sword belt buckle that would have been personally purchased, not regulation issue.

Type 8 (k, Figure 55)
One example: FS 696 SA 211 1.4 x .67 x .20 in .25 oz

Description: Single frame buckle; cast, filed brass; fragment; probably five-sided when whole, with one flat side, opposite side coming to a point; from Mexican battle line.

Type 9 (l, Figure 55)
One example: FS 243 SA 201 1.8 x 2.0 x .16 in .94 oz

Description: Waist belt buckle; cast brass; whole; rectangular plate with the number "4" cut out, in the same manufacturing style used on the Mexican Fourth Regiment cartridge box belt plates. Kevin Young (personal communication 1993) suggests this buckle was either was used by an officer since Mexican enlisted men did not wear waist belts, only suspenders, or by a rifleman--the latter needed a belt for their extra equipment; found on the Mexican battle line.

Type 10
Two examples:
FS 56a SA 49 2.4 x 1.3 x .24 in .80 oz (m, Figure 55)
FS 60 SA 3 1.7 x 1.2 x .24 in (fragment; not shown) .47 oz

Description: Double frame buckle; cast iron; whole and partial examples; no tongue; one end round in cross section, the other spatulate for accommodating harness belt end; both found on or behind the U.S. battle line, just south of Palo Alto pond. Doug Scott (personal communication 1992) identifies Type 10 as a U.S. harness buckle of early to mid-nineteenth century design.

Type 11 (n, Figure 55)
One example: FS 712 SA 211 2.3 x .79 x .12 in .46 oz

Description: Double frame buckle; whole: cast brass, brass patination is tan, unlike the distinctive dark green of Mexican brass; no tongue; frames are ovoid, joined by center post; opening of frames is .25 in wide; found west of Palo Alto Pond, just behind U.S. battle line. An object of similar size and design, found at eighteenth century Fort Stanwix near present-day Rome, New York, is described as a buckle for a sword baldrick (Hanson and Hsu 1975:93, Figure 51 L). Allie (personal communication 1993) believes Type 11 is an officer's sword buckle.

Type 12 (o, Figure 55)
One example: FS 335 SA 305 .67 x.59 x.08 inches .09 ounces

Description: Double frame buckle; cast brass; whole; plain rectangular with rounded corners; tongue absent but tongue wear present on center post and one of the frame sides, the latter slightly flattened to accommodate the strap end; found where one of the U.S. 6-pounder batteries probably was located. Allie (personal communication 1993) suggests this buckle was for a U.S. spur strap.

Buttons

A total of 28 buttons were recovered, all but one from the Mexican battle line. Of the 27 Mexican buttons, 21 are the standard issue button used on the Mexican enlisted mens' uniforms and were found on the Mexican battle line. This button type is identified in this report as Type 1 (Figure 56). Types 2-6 are also found on the Mexican battle line, and probably came from officers' uniforms since they have superior physical characteristics when compared with Type 1, or have backmarks indicating gilding. Type 7 is the only example of a U.S. button, found within the approximate location of the U.S. battle line. None of the recovered buttons supplies information regarding nationality, such

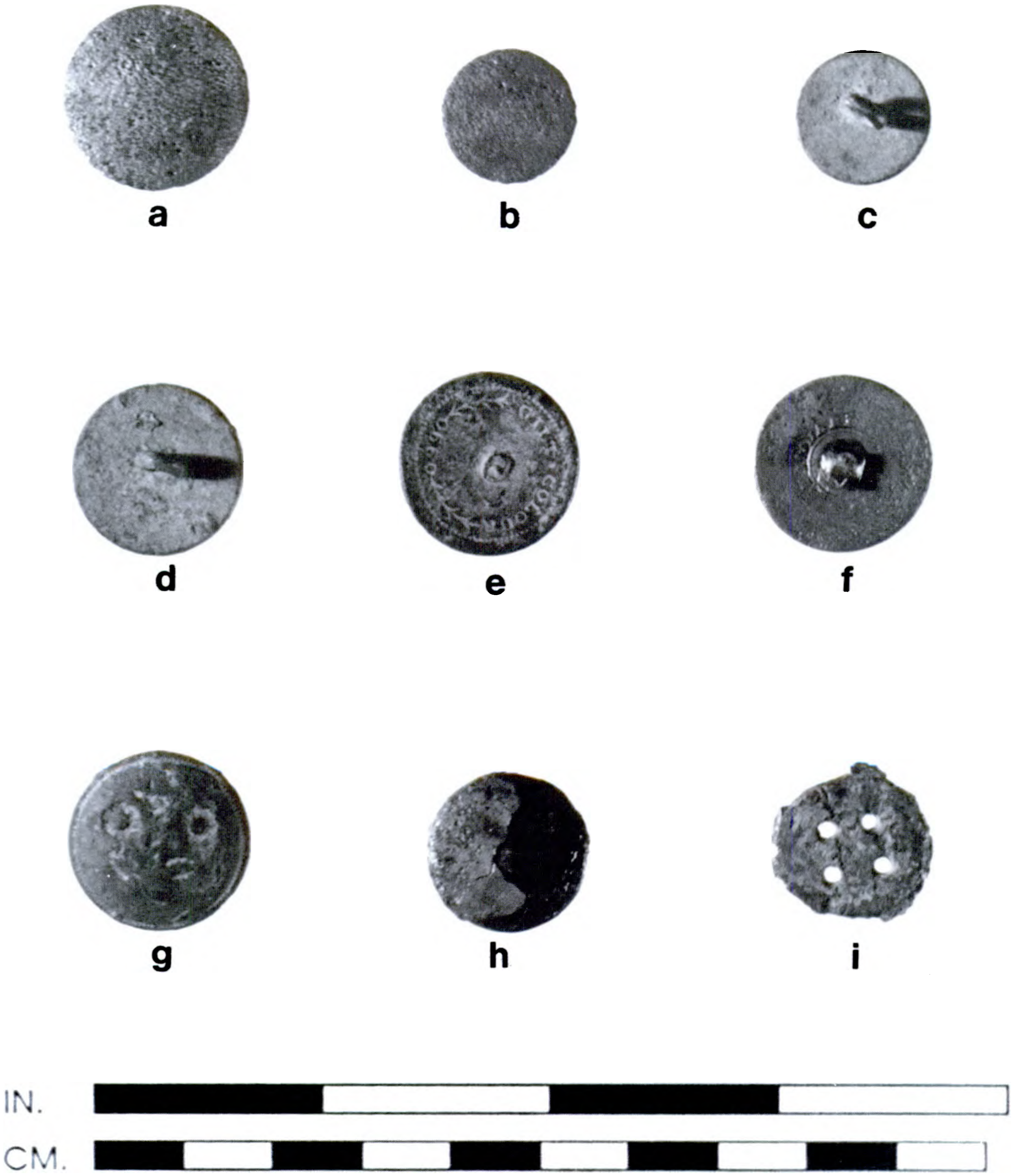


Figure 56. Buttons. a,b: Type 1, obverse; c: Type 1, reverse; d: Type 2, reverse; e: Type 3, reverse; f: Type 4, reverse; g: Type 5, obverse; h: Type 6, obverse; i: Type 7.

as the Mexican eagle-and-serpent or the American eagle, nor do they specify branch of service or regimental numbers.

Type 1 (examples a-c, Figure 56)
21 total recovered

Description: Two-piece button; stamped brass disc .04 inches thick, flat or slightly concave; brass, unfooted wire eye soldered onto the disc back. There are two sizes of this type: a .75-.83 in diameter button (a, Figure 56), used on the uniform coat (16 recovered); and a .59 inch diameter button (b,c, Figure 56), used on the uniform cuffs (five recovered). Both Type 1 sizes have been found in the Mexican siege trenches fronting the Alamo (Nesmith 1986:93) and in the Alamo plaza (Nesmith 1992:61-62). All of the Type 1 buttons were found on the Mexican battle line.

Type 1 attributes somewhat correspond with Olsen's Type G (1963:552) and South's Type 9 (South 1964:116), a metal disc having an unfooted eye, the latter fastened to the disc back with a drop of solder. A characteristic feature of Type 1, also noted for Olsen's and South's Types G and 9, respectively, was the tendency for the eye to separate from the button back since there was an inadequate fastening surface for the bonding metal. Of the 21 Type 1 buttons found at Palo Alto, only 6 still had their eyes attached. However, the above described British-American button types were popular from circa 1725-1812. They have a cast metal, .08 inch-thick disc that is reminiscent of a coin, hence its nickname "coin button", used by collectors. They often have a stamped design or insignia on the disc face, and sometimes backmarks (Olsen 1963:552; South 1964:118). In contrast, the construction method for the Type 1 Mexican button apparently was still practiced in Mexico at least as late as 1846. The relative thinness of the disc portion of the button allowed it to be made only by stamping, not by casting. None of the known examples of Type 1 buttons have stamping designs or military insignias on the front, nor are there backmarks.

Type 2 (d, Figure 56)
One example: FS 553 SA 209 .75 in dia. .14 oz

Description: Two-piece button; cast brass disc with soldered brass eye shank that is relatively thicker than the Type 1 wire eye; shank probably is footed but is hidden by the solder, more solder used than on Type 1; plain face; no backmark; does not appear spun or tooled; disc diameter indicates this is a coat button. Type 2 may be an officer's or noncommissioned officer's button in that it is better made, and presumably more expensive, than Type 1. Type 2 approximately corresponds with Olsen's Type H (1963:552) and South's Type 7 (1964:117).

Type 3 (e, Figure 56)
One example: FS 648 SA 209 .79 in dia. .05 in thick .11 oz

Description: Two-piece button; cast brass disc; eye missing; backmark present, stamped GILT COLOUR in English Gothic letters, and 0660, lettering and numbers separated by two wreath sprigs; gilding is no longer present. Disc diameter indicates this is a coat button. Type 3 probably is an officer's button, presumably imported from England; note "colour" spelling. According to Hefter et al. (1958:51), dismounted Mexican officers wore gold-plated buttons, mounted officers' buttons were silver-plated.

Type 4 (f, Figure 56)
One example: FS 284 SA 203 .83 in dia. .06 in thick .13 oz

Description: Two-piece button; cast brass disc; shank is missing, shank imprint on solder boss is suggestive the shank was not footed; backmark present, stamped STANDARD CO in English Gothic letters; spun back; plain face. Disc diameter indicates this is a coat button. The English backmark indicates Type 4 is an import.

Type 5 (g, Figure 56)
One example: FS 581 SA 209 .79 in dia. .08 in thick .16 oz

Description: Two-piece button; cast brass; domed; shank present and well soldered, probably footed; cast or etched design on the face consisting of two sunflowers with stems and leaves, and rouletting around the face; no backmark; diameter indicates this is a coat button. Olsen (1963), South (1964) and Noël Hume (1970) do not identify Type 5 as a button type found in eighteenth-nineteenth century contexts along the Eastern Seaboard. Type 5 is a nonmilitary button type popular in Europe from approximately 1830 to the 1860s. Although meant for civilian use, such buttons occasionally have been found in Texas at Mexican and U.S. military sites of the Mexican-American War era, as well as at Civil War sites. Type 5 was a relatively expensive button, and therefore, more likely to have been worn by an officer (Rod Bates, personal communication 1993). Officers in both armies were given some latitude in wearing civilian clothing.

Type 6 (h, Figure 56)
One example: FS 272 SA 203 .71 in dia. .20 in thick .14 oz

Description: Three-piece button; brass front and back are crimped together with a rolled edge on the back; shank missing but an iron stain is evident on the solder point, indicating the shank was made of iron; backmark STANDARD IMPERIAL in Gothic lettering is suggestive that England was the place of manufacture; similar to South's Type 12 (1964:118) and Olsen's Type I (1963:253); probably an officer's coat button.

Type 7 (i, Figure 56)
One example: FS 190 SA 5 .79 in dia. .08 in thick .09 oz

Description: One-piece button; cast white metal with cast line bisecting button; four-holed. Campbell (1963:Figure 17) and Johnson (1948:51-52) describe these as "Enlisted Men's White Metal Buttons", usually worn on fatigue clothing, and occasionally by infantrymen as a substitute for the regulation brass jacket buttons. Olsen (1963:252) classifies this button as Type K, further stating U.S. troops used them on trousers from about the War of 1812 to the end of the Civil War. This example was found on the battlefield, in the general area where it is believed the U.S. Fourth Infantry was positioned toward the end of the battle.

Uniform Brass and Accouterments

1) Canteen Spout

Two examples:
FS 204 SA 200 1.3 x 1.1 x .12 in .56 oz (a, Figure 57)
FS 855 SA 304 1.4 x 1.3 x .12 in .75 oz (b, Figure 57)

Description: Cast white metal; large fragments; rounded lip with slightly flared neck; FS 204 came from the Mexican battle line and FS 855 from a presumed U.S. battle position, possibly one of the positions held by Duncan's battery. This type of spout was used on a tin or wooden flat barrel-

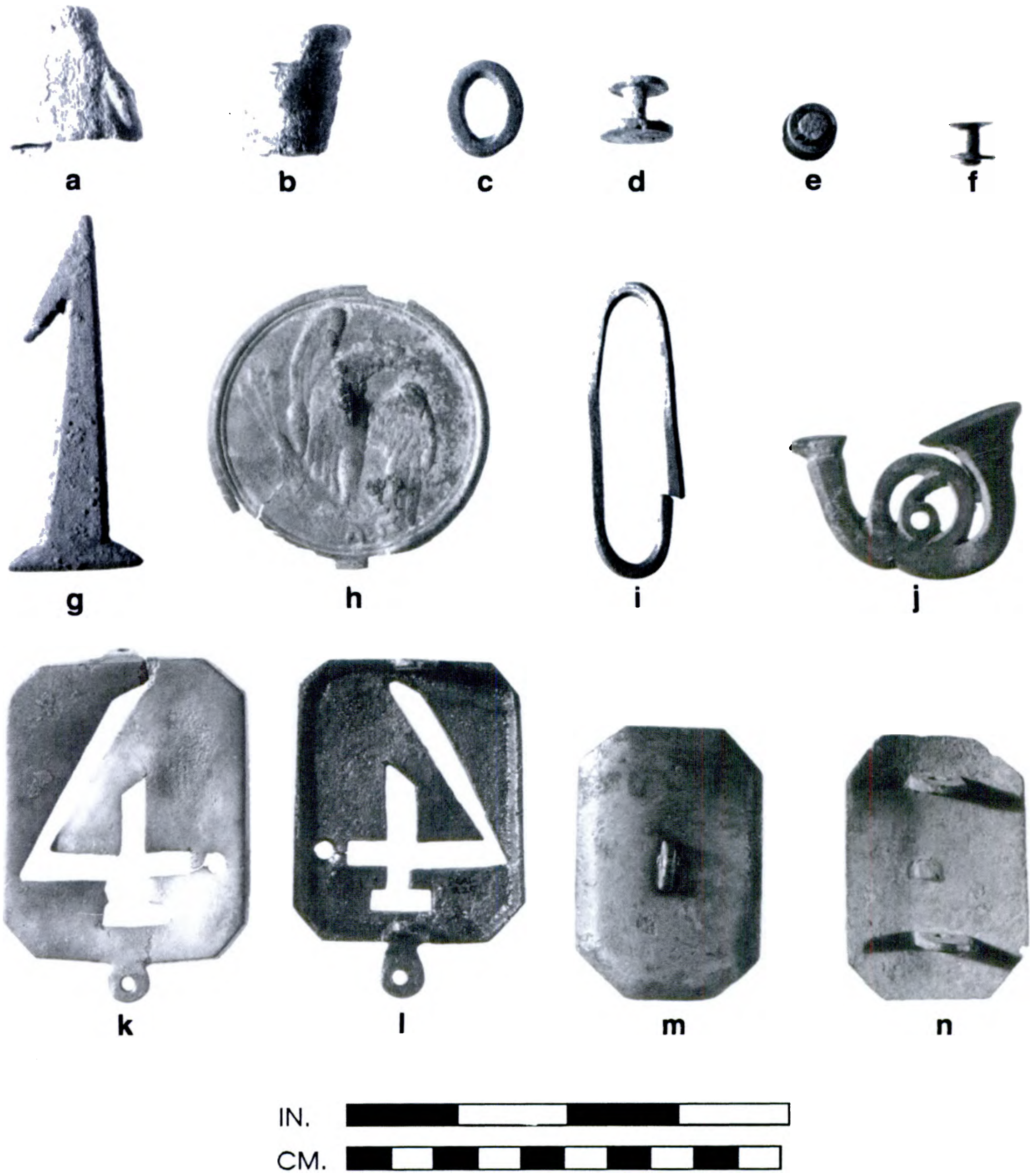


Figure 57. Uniform brass and accouterments. a,b: canteen spouts; c: Mexican Tenth Infantry emblem; d: Mexican belt stud; e,f: U.S. rivets-and-burrs; g: Mexican First Infantry emblem; h: U.S. cartridge box belt plate; i: Mexican belt suspension loop; j: Mexican Sixth Infantry emblem; k, l: Mexican Fourth Infantry cartridge box belt plates; m, n: Mexican cartridge box belt plates (generic).

type canteen. Both spouts are similar in metal alloy, dimension and shape; this is suggestive they ultimately came from the same manufacturer. The disparity in provenience of the two spouts is notable in that it indicates both U.S. and Mexican armies used this type of canteen. Mexican soldiers also used bottle gourds, a container preferred by many U.S. soldiers since it kept water cooler than the U.S. issue canteens (Elting 1977:122).

2) Regimental Emblem (c, Figure 57)
One example: FS 295 SA 204 .87 x .79 x .12 in .18 oz

Description: Cast and filed brass zero; whole; ovoid; obverse side slightly domed; reverse face is flat with two projecting prongs, each prong has a small hole to support a pin for attaching the zero to cloth or leather; found on the Mexican battle line. This artifact probably was paired with a "1" to form a "10", signifying the Mexican Tenth Line Regiment. Regimental numbers sometimes were embroidered onto the high-neck collars of Mexican uniforms; therefore, this artifact probably was attached to a Mexican leather shako or cloth forage cap (Hefter et al 1958: Plates 1, 4, 5, 9, 12, 13).

3) Belt Stud (d, Figure 57)
One example: FS 512 SA 209 .48 in long .60 and .50 in (disc ends dia)

Description: Cast and filed; cupreous; whole; used to secure and hold in place two leather belts that overlap (larger sizes used on harnesses); found on Mexican battle line.

4) Rivet-and-Burr
Four examples: all are .57 in diameter, .40 in long
FS 55 SA 49 .09 oz (e, Figure 57)
FS 64 SA 3 .10 oz (f, Figure 57)
FS 68 SA 3 .10 oz (not shown)
FS 84 SA 3 .08 oz (not shown)

Description: Cast copper; whole; plain, no makers' mark; all are from the U.S. battle line. This type of rivet-and-burr commonly is found at U.S. nineteenth century military sites, for example, Fort Bowie (Herskovitz 1978:64), Fort Craig (Haecker 1992:53) and Civil War battlefields (Dean and Dean 1990:74). They were used to reinforce objects such as knapsacks and cartridge boxes. Rivets for leather harness are larger than these artifacts.

5) Regimental Emblem (g, Figure 57)
One example:
FS 722 SA 211 3.2 x 1.2 x .28 in .72 oz

Description: Cast brass; whole; number "1", presumably the regimental insignia for the Mexican First Line Regiment; two fastening prongs on reverse, one prong slightly longer and bent. Samuel Nesmith (personal communication 1993) suggests this item went on a horseman's shabrak (alternate spelling *shabraque*), a saddle cloth of French influence. The asymmetrical lengths of the fastening prongs, Nesmith believes, allowed for attachment of decorative cords through the underside of the emblem.

6) Cartridge Box Belt Plate, U.S. (h, Figure 57)
One example: FS 856 SA 307 2.50 in dia. 1.2 oz

Description: Stamped brass disc; lead-filled back with embedded iron attachment wire; stamped design of U.S. eagle holding three arrows and an olive branch; found in vicinity where Duncan's battery probably was located toward the end of the battle. The leather shoulder belt that held the foot soldier's cartridge box from about 1845 to 1872 was decorated with this type of brass plate. The plate was thin-stamped brass with a lead-filled back, and a fastening device was embedded in the lead. As used nonfunctionally on the cartridge box belt, the plate had fasteners of iron wire. However, when used on sergeants' shoulder sword belts consisting of two branches, the plate was used to join the branches. For this purpose, it was fitted with three "arrowhead" or "puppy paw" hooks, or hooks of bent wire. The presence of a linear streak of rust on the back of FS 856 is suggestive this was used on a cartridge box belt. Since artillerymen would not have been wearing cartridge boxes, this object probably was lost by an infantryman, perhaps one from the Eighth Infantry that supported Duncan's battery toward the end of the battle.

7) **Belt Suspension Loop** (i, Figure 57)
One example:
FS 340 SA 201 2.8 x .87 x .12 in .46 oz

Description: Cupreous; whole; ovoid; one side broken; made of drawn wire; square in cross-section; approximate dimensions of the Type 6 buckle, except the latter is round in cross-section. Samuel Nesmith (personal communication 1993) suggests FS 340 was used to hold objects suspended from a crossbelt.

8) **Regimental Emblem** (j, Figure 57)
One example:
FS 633 SA 211 2.2 x 1.5 x .24 in .90 oz

Description: Cast brass: whole; infantry horn emblem, with the number "6" inside the horn loop; two fastening prongs on reverse; emblem identifying the Mexican Sixth Line Regiment. Hefter et al. (1958:Plate VIII, e) illustrates such an emblem, but without a regiment number, pinned onto a Mexican cloth barracks cap. A similar emblem, but with a different regimental number, was found in the Mexican mass grave at Resaca de la Palma (Eric Ratliff, personal communication 1993).

9) **Cartridge Box Belt Plate**
Two examples:
FS 234 SA 203 3.1 x 2.3 x .11 in 1.16 oz (k, Figure 57)
FS 201 SA 200 2.6 x 2.1 x .12 in 1.94 oz (l, Figure 57)

Description: Cast and filed brass; whole; an elongated, flat sided octagonal; one pair of prongs on reverse side and one prong on obverse, the latter at right angles with prongs on the reverse, all three prongs have a hole; an open-cut, European-style "4" on the face of the plate, with a small hole to the right, the latter the European circular symbol that represents the number suffix "th"; the objects identifying the Fourth Line Regiment; found on the Mexican battle line.

Steven Allie (personal communication 1993) believes this artifact type had the same function as FS 381, in that they secured a chain from which a musket vent pricker and muzzle brush was suspended; if this function is correct, the Fourth Line Regiment infantrymen sported customized beltplates, unlike the regiment(s) that wore the more generic beltplate represented by FSs 381, 659 and 808. Although similar in overall design, the two Fourth Regiment items differ somewhat in overall dimension, weight, prong shape and design of the number "4"; this indicates each object either was made from a unique casting or came from different suppliers.

10) Cartridge Box Belt Plate

Three examples:
FS 381 SA 207 2.6 x 1.7 x .20 in 2.3 oz (m, Figure 57)
FS 808 SA 211 2.4 x 1.7 x .20 in 1.5 oz (n, Figure 57)
FS 659 SA 211 2.4 x 1.7 x .20 in 1.5 oz (two prongs missing; not shown)

Description: Cast and filed brass; elongated octagonal with convex/concave profile; one pair of prongs on reverse/concave side and one prong centered on obverse/convex side; all three prongs have a hole through them; found on the Mexican battle line. Steven Allie (personal communication 1993) suggests this artifact was positioned on the cartridge box belt worn by the Mexican infantryman. The two prongs on the reverse/concave side would have aided in the fastening of the object to the shoulder belt; the prong on the obverse/convex side would have secured the chain that held the infantryman's musket vent pricker and muzzle cleaner brush. These latter two items had to be readily accessible for in-field maintenance of a fouled musket, an all too frequent occurrence for black powder firearms.

Personal Possessions

1) Lead Ball Portions

Two examples: FS 403 SA 306 .60 x .40 x .25 in .25 oz (a, Figure 58)
FS 772 SA 211 .30 x .38 in (b, Figure 58)

Description (FS 403): One-quarter of a cut lead ball; two flat sides, one rounded side; length is suggestive this was from a ball intended for a .62 caliber (Mexican) Baker rifle; found on the southern end of SA 306, Mexican battle line.

Description (FS 772): One-eighth of a cut lead ball; three flat sides, one curved side; original caliber not identifiable; from Mexican battle line.

Due to their modified nature, this artifact type has been identified as a personal possession instead of "Ordnance, Lead Ball". Soldiers of the American Revolution (Calver 1928:120-127) and Civil War (McKee and Mason 1980:69) fabricated a wide variety of non-military objects such as chess pieces, whistles and toy cups from lead projectiles, as well as partially halved and quartered projectiles in order to inflict more dangerous wounds. Civil War encampments in the Brownsville area also have yielded numbers of halved and quartered lead balls (Cecil Allison and Rod Bates, personal communications 1992). These objects may have been used as gaming counters and gambling chips.

2) 1/4 Real Coin

One example: FS 206 SA 200 .47 in dia. .02 oz (c, Figure 58)

Description: Silver coin; obverse shows head of Liberty facing left, to right of head are letters LR, the initials of Luciano Rovira, engraver of the Mexico mint; No mint mark, indicating it was minted at San Luis Potosi since initials of this mint were not placed on denominations of this size. The reverse bears the fraction 1/4 surrounded by *REPUBLICA DE MEXICO* and the date 1843. Coins of this denomination were minted beginning in 1842 in response to a lack of small change and as a replacement for the virtually worthless copper 1/16 and 1/8 *reales* issued by the Federal and State governments. The minting of 1/4 *real* coins was suspended after 1863 following the changeover to the decimal system (Buttrey and Hubbard 1992:54-55). By 1839, the Mexican private's pay for a month amounted to 15 pesos, a sergeant received 26 pesos, a General 500 pesos. From this wage

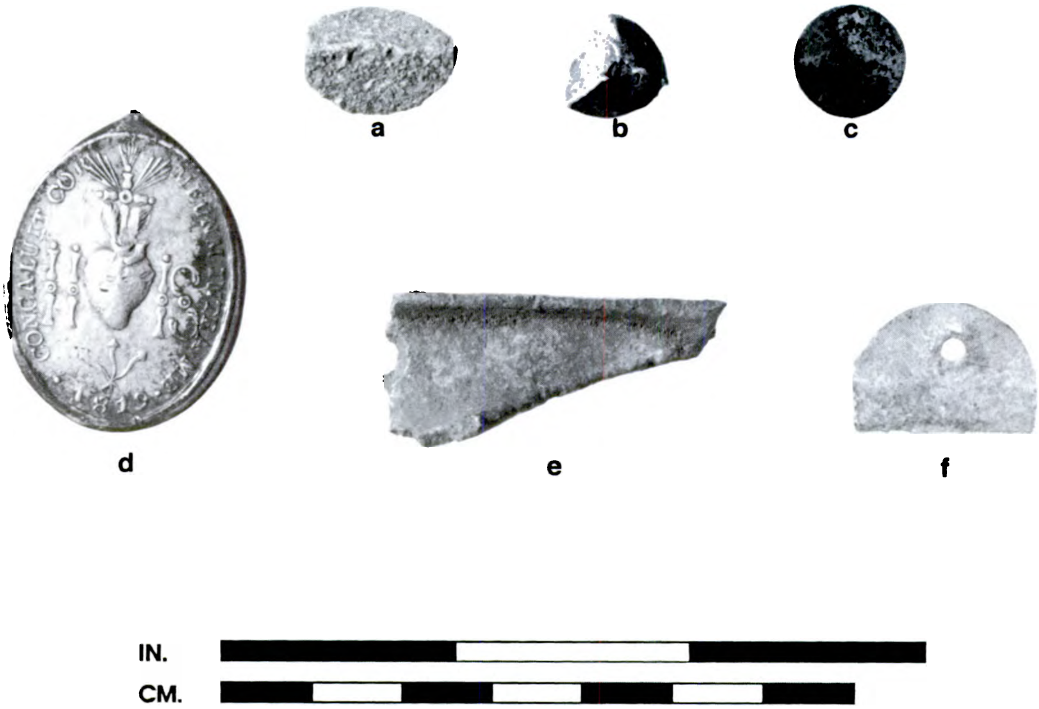


Figure 58. Personal possessions. a: one-quarter of .62 cal. lead ball; b: one-eighth of lead ball; c: Mexican 1/4 real coin; d: religious medallion; e: brass pot fragment; f: pendant (?) fragment.

were deducted his monthly costs for laundry, barber, shoes, cigars, etc. A *real* was 1/8 of a peso, and a peso was one ounce of silver approximating one U.S. dollar of the period. A 1/4 *real* coin in 1846 was worth around 1/32 of a peso, or 3 cents U.S. (Hefter et al. 1958:53, 62).

3) Religious Medallion (d, Figure 58)
One example: FS 832 SA 99 1.3 x .87 x .08 in .38 oz

Description: Ovoid silver medal, minus suspension loop; found within SA 99, an area presumably between battle lines. Obverse inscription, aligned around the border of the medal: *CONCALUIT COR MEUNM INTRA ME* ("Aflame my heart within me"), with central iconography of the Sacred Heart with a crown of thorns, three nails and *IHS*; date of 1819 at distal end. Reverse inscription: *APPRENDED DE MI QUE SOY MANSO Y HUMILDE DE CORAZON* ("Learn from me that I am gentle and humble of heart"). Given its inscription in Spanish and battlefield provenience, this artifact conceivably was lost by a Mexican cavalryman engaged in the failed attack on the U.S. 18-pounders.

4) Metal Pot Fragment (e, Figure 58)
One example: FS 842 SA 99 1.5 x .67 x .20 in .26 oz

Description: Cupreous pot; cast; fragment; portion of a flat rim, slightly flared outward; mold seam on pot body; found more or less between battle lines. FS 842 may be battle related, perhaps part of a mess kit. The use of heavy gauge brass and method of manufacture suggests to Nesmith (personal communication, 1993) this artifact is of Mexican origin.

5) Pendant(?) (f, Figure 58)
One example: FS 594 SA 209 .79 x .59 .12 in .08 oz

Description: Cupreous; flat; fragment; punched hole on the end having a curved edge, presumably to allow for passage of a string or chain; appears to have been halved by cutting; both sides are plain-faced; from Mexican battle line.

6) Bottle Base Fragments
Two examples:
FS 360 SA 202 2.75 in dia. (a, Figure 59)
FS 274 SA 203 3.30 in dia. (b, Figure 59)

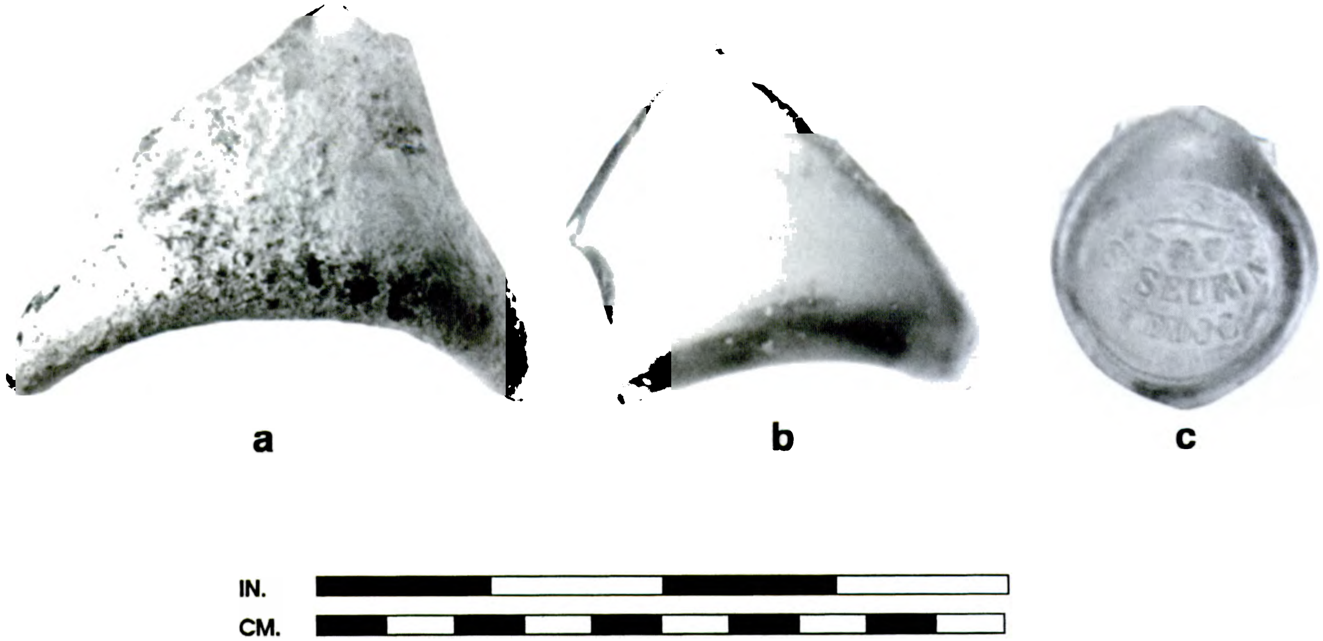


Figure 59. Personal possessions, wine bottle fragments. a,b: wine bottle bases; c: wine bottle seal.

Descriptions: Dark green glass; fragments; both bottle bases have high basal kick-ups, a characteristic of both wine and champagne bottles; neither kick-ups have pontil marks, which is suggestive of a post-1840 manufacture date (Kendrick 1967:20). Bottle base diameter of FS 360 corresponds with French wine bottles found on the paddlewheel *Bertrand*, sunk in 1865; these wine bottles held 25.5 oz. Base diameter of FS 274 approximately corresponds to mid-nineteenth century champagne bottles that held 29 oz (Switzer 1974:27-29, 91, 92).

7) Wine Bottle Seal (c, Figure 59)
One example: FS 761 SA 211 1.8 x 1.5 in .28 oz

Description: Dark green wine bottle glass consisting of a portion of bottle shoulder with a glass seal gather impressed onto it; impressed with ST. SEURIN MEDOC and a cluster of grapes at its center; found in Mexican battle line. Medoc is a famous red wine producing region in the Bordeaux district of France. *Saint Seurin*, its full name *Saint-Seurin-de-Cadourne*, is the appellation of one of the smaller wine-producing communes (a parish or township) within the *Haut Médoc*, a subdistrict noted for its finer wines.

In the Classification of 1855, the year of introduction of a wine grading system, wines produced from Saint Seurin were graded *Crus Bourgeois* and *Crus Artisans*, indicating wines of third and fourth levels of excellence, respectively, that command correspondingly less premium prices, compared to other wines from its subdistrict (Simon 1957:15-27). At Palo Alto battlefield, a bottle of imported wine would have been a personal purchase by someone who could best afford such a high-status luxury, an officer. Presumably this individual was in the Mexican Army, as is suggestive by the location of the artifact on the Mexican battle line.

Farriery and Horse Tack

1) Horseshoes
Three examples:
FS 389 SA 306 3.5 x .59 x .39 in 1.2 oz (fragment) (a, Figure 60)
FS 367 SA 208 5.8 x .59 in 1.80 oz (fragment) (b, Figure 60)
FS 390 SA 306 1.5 x .60 in .80 oz (fragment) (not shown)

Description (FS 389): Ferrous horseshoe; branch fragment; artifact is deteriorated but has general characteristics of U.S. mass-produced horseshoes in terms of width, thickness, shape and spacing of nail holes (three holes are visible); found more or less between battle lines, eastern end of battlefield.

Description (FS 367): Ferrous horseshoe: branch fragment; artifact is too deteriorated to identify distinguishing characteristics, although its general dimensions are more typical of a machine-made, nineteenth century U.S. horseshoe (Noël Hume 1970:238; Association for Preservation Technology 1980 [1865]:250) than those made in Mexico; the latter were wider and reminiscent of horseshoe styles of the late eighteenth century (Woodward 1953:194; Noël Hume 1970:238; Chappell 1973:107); found within area of the Mexican battle line, although the horseshoe may not be battle-related.

Description (FS 390): Ferrous horseshoe; heel fragment; width (3/8 in) and thickness (5/8 in) typical of U.S. military and civilian horsehoes of the period (Association for Preservation Technology 1980 [1865]:250), thus possibly battle related; found more or less between battle lines, eastern end of battlefield.

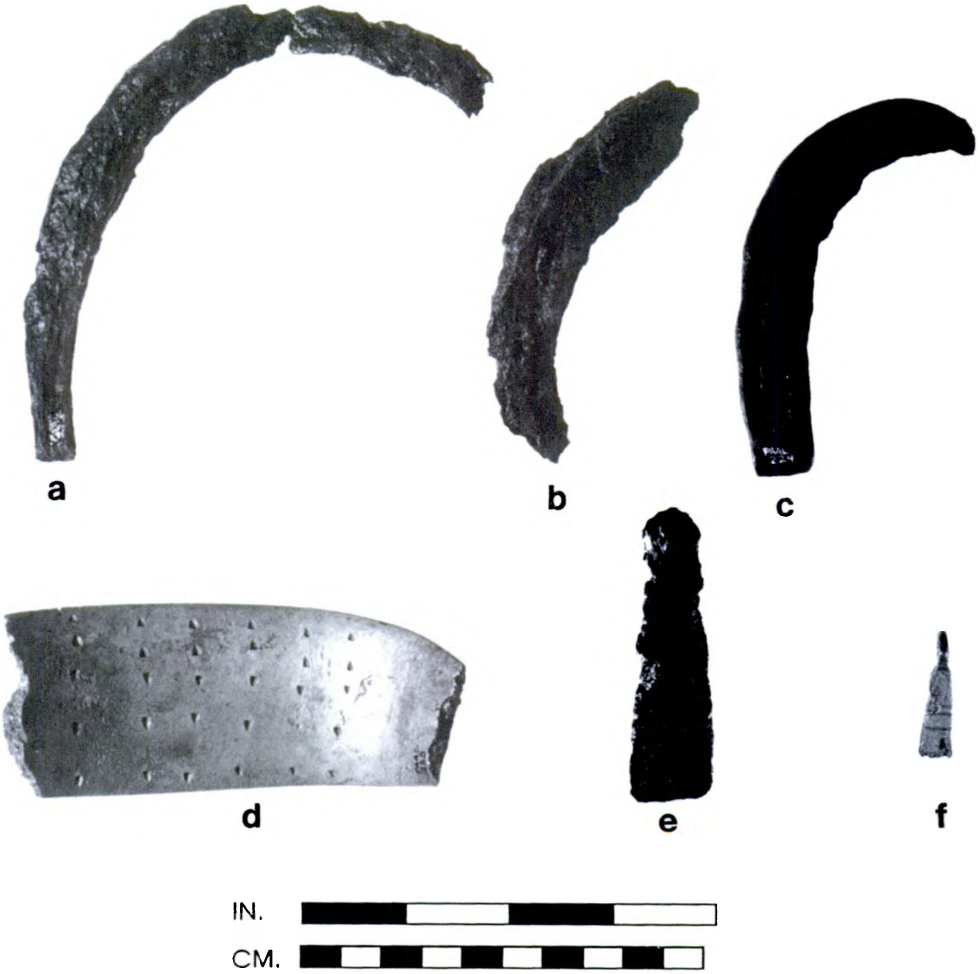


Figure 60. Farriery and horse tack. a,b: horseshoe fragments; c: ox shoe half; d: Mexican stirrup (?) fragment; e: U.S. spur sideplate; f: Mexican coscojo.

2) Oxshoe (c, Figure 60)
One example: FS 61 SA 3 3.9 x .71 in 6.5 oz

Description: Ferrous; whole; three nail holes in the branch are barely discernable. An ox shoe is split, therefore two asymmetrical shoes for each hoof are needed; FS 61 is a left side shoe. Found near the U.S. battle line in the general vicinity of the wagon road. The artifact may be battle related since oxen were used to pull the 18-pounder battery as well as U.S. supply wagons.

3) Stirrup(?) (d, Figure 60)
One example: FS 363 SA 202 4.3 x 2.0 x .20 in 4.9 oz

Description: Cupreous; cast, filed and hammered; fragments; concave side has a series of triangular depressions, possibly made by a punch; possibly a fragment of a Mexican stirrup, as suggested by its overall shape and size; from the Mexican battle line.

4) Spur Sideplate (e, Figure 60)
One example: FS 337 SA 305 3.0 x .95 in .59 oz

Description: Wrought iron strap; fragment; two iron round-head rivets projecting out from one side, .60 in apart; narrow end of strap is rounded, the other side ends along a break line; found on the U.S. battle line, where Duncan's battery probably was stationed. Samuel Nesmith (personal communication, 1993) identifies this as part of a sideplate for a spur. The forward stud is for the upper strap, the end stud for the heel strap.

5) *Coscojo* (Jingle) (f, Figure 60; Figures 61, 62)
One example: FS 366 SA 208 1.3 x .35 x .20 in .13 oz

Description: Cupreous; filed and hammered; whole; flat strip with loop at one end, two filed notches at opposite end to represent a stylized fist; from Mexican battle line. *Coscojos* were arranged in series on Mexican bridles and bits; they were both decorative and pleasant to hear when traveling. Coscojos came in a variety of forms. One of the more common types is represented by FS 366, that is, the *fica,* a clasped hand with the thumb projecting between the fist and second fingers. This was a common Old World symbol for warding off the Evil Eye (Simmons and Turley 1980:101, 103, 115), and is commonly found on Mexican horse hardware.

Hardware

1) Machine Harvester Tooth (a, Figure 63)
One example: FS 44 SA 4 2.3 x 1.6 x .18 in 1.2 oz

Description: Cast iron or steel; whole; beveled and ground edge; hole for mounting onto harvester gang rod; post-battle related.

2) Machinery Fragment (b, Figure 63)
One example: FS 82 SA 5 1.8 x 1.5 x .28 in .95 oz

Description: Cast iron; fragment; .25 in dia. bolt hole present; from U.S. battle line but is probably post-battle related.

3) Ring
Two examples:
FS 88 SA 3 1.5 in dia. .25 in thick .55 oz (c, Figure 63)
FS 438 SA 309 2.0 x 1.2 x .83 in 1.8 oz (d, Figure 63)

Description (FS 88): Cast or wrought iron ring; whole; from area of the U.S. battle line but may not be battle related.

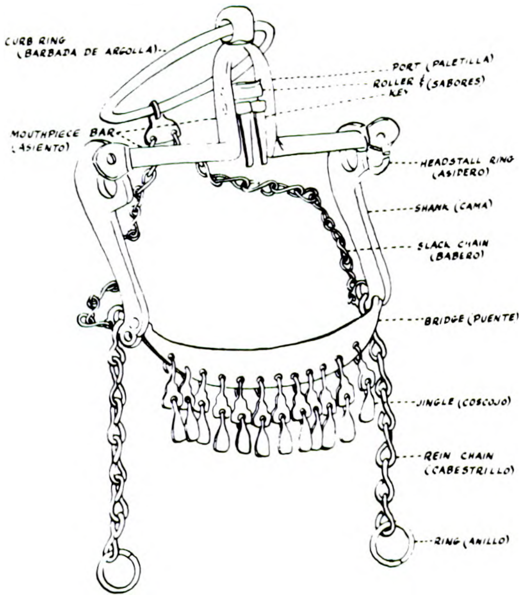

CURB RING
(BARBADA DE ARGOLLA)
PORT (PALETILLA)
ROLLER & KEY (SABORES)
MOUTHPIECE BAR
(ASIENTO)
HEADSTALL RING
(ASIDERO)
SHANK (CAMA)
SLACK CHAIN
(BABERO)
BRIDGE (PUENTE)
JINGLE (COSCOJO)
REIN CHAIN
(CABESTRILLO)
RING (ANILLO)

Figure 61. Mexican bridle. Note placement of *coscojos.* Illustration by Frank Turley, In Simmons and Turley (1980:101), with permission of Museum of New Mexico Press.

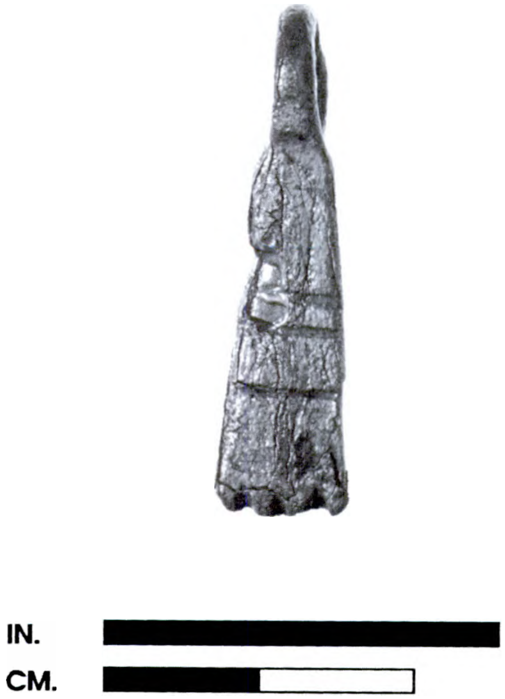


Figure 62. *Coscojo.*

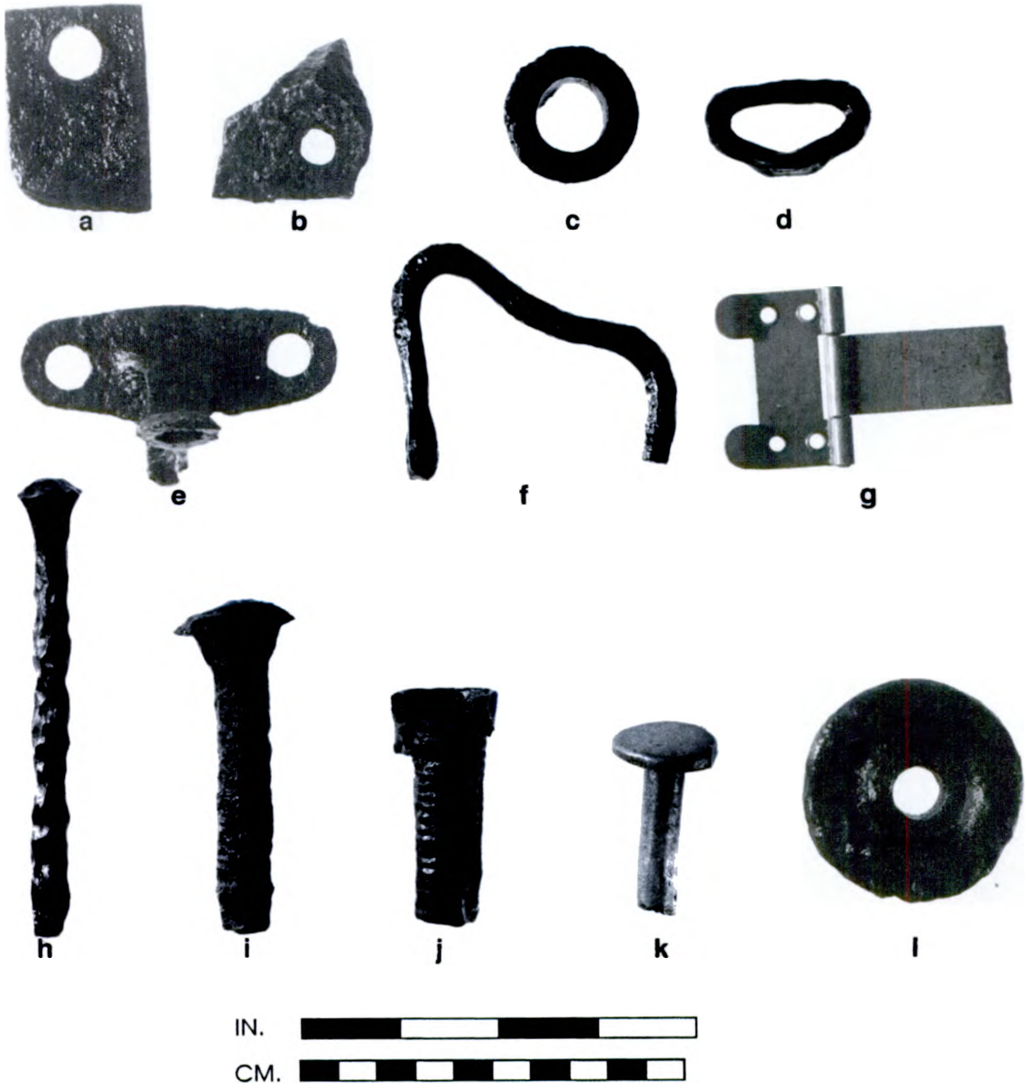


Figure 63. Hardware. a: machine harvester tooth; b: machinery fragment; c,d: rings; e: support bracket; f: cold shut; g: hinge; h: linch or drift pin; i-k: bolts; l: washer.

Description (FS 438): Cast or wrought iron ring; fragment; ovoid; found within area of the U.S. battle line but may not have been deposited at time of battle. Samuel Nesmith (personal communication, 1993) states this could have been an attachment ring for a gun carriage chain.

4) Support Bracket (e, Figure 63)
One example: FS 149 SA 3 3.3 x 2.1 x 1.85 in 4.8 oz

Description: Cast or wrought iron; whole; wagon box or wagon seat support bracket; two bolt holes on bracket flanges; from U.S. battle line. This artifact may not have been deposited at the time of battle.

5) Cold Shut (f, Figure 63)
One example: FS 34 SA 11 1.8 x .20 in 1.8 oz

Description: Ferrous cold shut; whole; cast steel or iron rod; bent or cast into asymmetrical shape; one end widens to accommodate a hole for attachment; identified by James Ayres (personal communication 1993) as a "cold shut", a piece of iron round stock used to repair a broken chain; found on U.S. battle line but may not be battle-related.

6) Hinge (g, Figure 63)
One example: FS 45 SA 49 2.9 x 1.8 x .16 in 1.0 oz

Description: Brass hinge; cast; fragment; box or chest hinge with hasp end broken off; two pairs of countersunk screw holes; from U.S. battle line. This artifact may not be battle related, since its design was in use throughout the nineteenth and early twentieth centuries.

7) Linch or Drift Pin (h, Figure 63)
One example: FS 191 SA 31 4.7 x .70 in 2.5 oz

Description: Wrought iron linch- or drift pin; whole; unthreaded cylindrical shaft with hexagonal head; tip blunted or broken off; found within area of U.S. battle line but may not have been deposited at time of battle. A drift pin is a tool used for ramming or driving down a heavy object, or for enlarging or shaping holes; a linchpin is used at the end of an axletree to prevent the wheel of a vehicle from sliding off. Linchpins would have been used on wagons, caissons and gun carriages, with spares stored in the limber chest of an artillery battery's wagon forge (Gibbon 1860:Appendix, p.17); a drift pin would have been a useful tool for an army smithy, although such a tool is not specifically listed in inventory stores for an army blacksmith's limber chest (Gibbon 1860:Appendix, p.21).

8) Bolts
Three examples:
FS 47 SA 49 3.6 x 1.8 x .24 in 2.5 oz (fragment) (i, Figure 63)
FS 450 SA 308 2.6 x 1.1 x .35 in 2.6 oz (fragment) (j, Figure 63)
FS 361 SA 202 1.8 x 1.1 x .40 in 1.7 oz (fragment) (k, Figure 63)

Description (FS 450): Ferrous bolt; two fragments; steel or iron; one fragment is a threaded cylindrical shaft with a partially crushed distal end; the other fragment partly encloses the proximal end; from the eastern edge of the battlefield, possibly between the battle lines; may not be battle related.

Description (FS 47): Ferrous bolt; whole; cast steel or iron; cylindrical shaft, unthreaded; domed head, 1.25 in dia; distal end is flat; specific function unknown; from the vicinity of the U.S. battle line; may not be battle-related.

Description (FS 361): Cupreous bolt; cast and filed; unthreaded with 1.2 in dia. head; base is sheared off; specific function unknown; from Mexican battle line.

9) Washer (l, Figure 62)
One example: FS 118 SA 8 2.0 in dia. .20 in thick

Description: Cast iron; whole; interior hole is .5 in dia; from the vicinity of the U.S. battle line but may not be battle related.

Miscellaneous Artifacts

1) Cosmetics Compact Cover(?)
One example: FS 49 SA 49 1.7 in dia. .40 oz (not shown)

Description: Brass cover; largely intact; cast and lathed metal with etched concentric circle/floral design on obverse; stamped RICHARD HUDNUT NEW YORK.PARIS in gothic lettering near the hinge joint. Richard Hudnut was a cosmetic company founded during the 1880s. The business was sold to Pfeiffer Brothers Pharmaceuticals in 1916, and, after a series of mergers, the Richard Hudnut Cosmetic Division became part of Warner Lambert Pharmaceutical Co.; however, the name "Richard Hudnut" continued in use on its cosmetic products (Warner Lambert Pharmaceutical Co., letter dated March 9, 1993). FS 49 has an overall appearance of a watch cover but it is doubtful such an item would have been manufactured by a cosmetics company, unless pocket watches were used as promotional items.

2) Cannon Round Fragment
One example: FS 214 SA 200 1.6 in dia. 1.6 oz (not shown)

Description: Steel base cover to a Model 1897, 75 mm cannon round.

3) 75 mm Cannon Round Nose Fuse
One example: FS 586 SA 209 2.6 in long, 2.4 in dia. 18.4 oz 520.7 g. (c, Figure 45)

Description: Aluminum alloy nose fuse to a Model 1897, 75 mm cannon high explosive round.

Bone, Human

Three human bone fragments were found on the surface. These remains were collected for positive identification. Dr. David Flory, MD, of Baptist Hospital in Harlingen, Texas, examined the remains. After identification, the bones were returned to their previous surface locations. Specimens 1 and 2 were found in SAs 5 and 6, between the battle lines; and Specimen 3 was found in SA 309, possibly associated with the Mexican right flank attack that occurred toward the end of battle. Dr. Flory describes the three bone fragments as follows:

Specimen 1: Distal end of a right human tibia, soil stained and weathered; fractured and splintered from unknown causes, possibly at time of deposition; overall diminutive dimensions are suggestive of an adolescent or young adult of small stature.

Specimen 2: Proximal one-third of a left human femur, soil stained and weathered; sharp break in shaft, possibly at time of deposition; overall diminutive dimensions are suggestive of an adolescent or young adult of small stature.

Specimen 3: Right human talus (heel); whole; soil stained and weathered; adult.

CHAPTER EIGHT

CONCLUSION

As noted in Chapter 1, the primary goal of the 1992-1993 investigation of Palo Alto battlefield was identification of the battle line positions taken by the two opposing armies. Achieving this goal required four, mutually supportive sub-goals. These sub-goals and their summary conclusions are as follows:

1) Acquisition and synthesis of primary documents to provide a basis for comparison with the archeological data.

A researcher of an historical event obtains documents sufficient for plausible reconstruction of that event. A possible corollary to any effort of this scope is the concern not enough time was invested to find all of the relevant documents on which such a reconstruction must depend. Undoubtedly, great numbers of undiscovered primary sources pertaining to the battle of Palo Alto exist. Yet, given the constraints of this project, a respectable number of historically significant primary sources were obtained, analyzed and synthesized.

An attempt was made to classify primary sources as to their degrees of reliability, the resulting data synthesized and compared with archeological data. This research approach was found appropriate since: 1) archeological field time could be spent in areas where a specific battle event likely occurred; and 2) it lessened the possibility of comparing archeological data with more or less imprecise historical data. Both written and schematic battle accounts from reliable sources provided source materials for interpreting specific artifact patterns. For example, concentrations of U.S. canister shot found along the eastern margins of Area F is believed the result of the documented cannonading by Duncan's battery on the Mexican right flank.

Of course, in a perfect world, one realizes a consistent correlation between presumed "good" historical data and the archeological pattern. In fact, this desired outcome was not realized for several critical areas of the battlefield. Very little archeological evidence presently exists to support historical documentation, reliable or otherwise, regarding: 1) initial battle line locations of either army; 2) flanking and counter-flanking activities on the west side of the battlefield; and 3) location of the U.S. army during the final phase of the battle. However, negative information, that is, the absence of artifacts where in theory they should exist in relative abundance, does not necessarily throw the historical accounts into question since relic collecting and ground disturbances have resulted in a flawed archeological record for the battlefield. In addition, randomly placed survey units may have simply missed such evidence. Obviously, further fieldwork is required within these and other areas of the battlefield, guided as always by data from documentary research.

2) A study of present-day topographic features at Palo Alto will determine if these same features existed in 1846 and, if so, assess their relevance to battle conduct.

Comparisons of eyewitnesses' schematic topographic descriptions with present-day topographic features often resulted in positive correlations, actual physical links with the historical past. Thus, certain natural and cultural features found today on the battlefield were used as points of reference in choosing promising areas for archeological study. For example, local lore identifies a particular present-day low rise as "Arista Hill", one of Berlandier's *motitas* (Area E) that was the anchor of the Mexican right flank. If this identification is correct, then physical evidence of at least a portion of the Mexican battle line should be somewhere west of Area E. Survey of this area did, in fact, locate strong linear evidence of the Mexican battle line, presumably of the final phase of the battle. One can thus accept with confidence the local belief that "Arista Hill" is the same *motita* described by Berlandier. Area F is most likely the marshy area noted by a few battle participants as an obstacle between the opposing battle lines. This feature is apparent on the aerial photograph (Figure 3), and is partially delineated by an artifact distribution pattern around it (Figure 41). The biological survey of the battlefield indicates Area F extends along a roughly northeast-southwest axis, which roughly corresponds with the presumed axis of the final Mexican battle line.

The *lomas tendidas* of Area G seemingly lack the more obvious physical characteristics present at the time of battle. Presumably these *lomas* comprise a resaca levee extending in a southeasterly direction from "Arista Hill". Post-1846 erosional actions, such as from hurricane flooding, certainly could have obliterated this feature along with the vegetation that may have stabilized it. At present, heavy rains periodically delineate the existing meager remnants of this levee.

Local tradition also identified the approximate location of Palo Alto pond (Area A). Both vegetation removal and drainage activities during at least the last 50 years apparently destroyed any remaining in situ battlefield-related evidence, such as the earthen fortifications that protected the U.S. wagon train following the battle. However, a few artifacts were found in Area A, such as an ox shoe, cartridge box or knapsack rivets, and a U.S. officer's sword buckle. These artifacts lend some scanty support to the belief this area of the battlefield was associated with the initial U.S. battle line.

Area C encompassed the resaca that figured prominently during the initial battle activities. Identification is based not so much on archeological evidence as on the evidence the present-day resaca is within its documented location, and it essentially has the same meandering configuration as the resaca described in 1846. Thick vegetation cover west of the resaca prevents conclusive archeological identification of battle activities here.

Analysis of the battlefield aerial photograph hints at vestiges of the old Matamoros wagon road (Area B). Identification of disturbance vegetation dominance within Area B lends support to this belief. However, Area B also is devoid of archeological evidence. Does this mean little or no battle-related activities took place along this remaining road segment? Or is the ca. 1846 road actually somewhere else? A survey method appropriate for the thick vegetation cover is required for this area of the battlefield.

3) The post-battle history of Palo Alto indicates to what degrees the battlefield topography and artifact patternings have been affected.

There is sufficient documentation to indicate unevenly distributed adverse effects on the archeological record. Battle-related objects were removed as soon as the battle was over, both as souvenirs and as salvage for reuse. By itself, this initial removal would not have destroyed the overall artifact patterning. Unfortunately, relic collecting as a sport has damaged several nonvegetated areas easily accessible to collectors, and the greatest damage to site integrity has been caused by those using metal detectors. Site damage is largely concentrated within areas of sparse vegetation cover and where artifacts are periodically exposed due to plowing. Battle interpretation also may be compromised by those who have selectively collected only certain categories of artifacts such as Mexican accouterments, leaving behind a skewed artifact pattern consisting of mostly "rejected" artifacts, such as iron shrapnel fragments. Fortunately, a covering of tall cordgrass protects key portions of the battlefield. These areas are something of an archeological preserve, representing the last remnants of pristine artifact patterning, and must be protected from any future illicit collecting.

Not all effects on the battlefield have been deleterious. Specifically, the heavy growth of mesquite-cordgrass chaparral west of Area C, the resaca, presently protects this portion of Palo Alto battlefield. This forest has existed here for decades; therefore, it is likely relatively pristine archeological evidence of Mexican flanking maneuvers and U.S. defensive counter measures still exist below this protective vegetative covering. The same type of vegetative protection situation also may protect locations of the Mexican hospital and baggage train. Again, a method for subsurface archeological data retrieval specific to dense vegetation cover is required.

4) Analyses of individual artifacts and artifact distribution patterns may provide corroboration or refutation of specific battlefield events.

Besides simple identification of the extent and nationality of the battle lines, artifact spatial analysis provided strong physical evidence of specific battle events and was largely successful in corroborating various eyewitness accounts. Spatial analysis identified the following battlefield actions:

1) A general clustering of Mexican cannon balls occurs in one area of the battlefield where documents place Duncan's battery. This confirms battle accounts describing Mexican attempts to destroy U.S. artillery via artillery barrages;

2) Concentrations of Mexican shot probably define the area where it was documented U.S. dragoons were repulsed by this type of ordnance;

3) U.S. light artillery batteries concentrated their firepower on the closest Mexican units. This is evidenced by significant concentrations of U.S. 6-pounder canister shot between battle lines. In contrast, 18-pounder shell and spherical case shrapnel predominated within areas of the Mexican battle line beyond normal range of U.S. light artillery when firing canister;

4) U.S. spherical case shrapnel sharply delineates a segment of the final Mexican battle line position. This segment, more than 400 ft long, extends along an almost north-south axis. A number of battle maps likewise illustrate this same axis for the final Mexican battle line. This patterning is especially significant in light of the fact that previous interpretations of Palo Alto extend the battle lines along an initial east-west axis, with the second phase pivoting no more than 35° towards the northwest;

5) The greatest concentration of recorded artifacts center around the marshy area of Area F, and apparently reflects the actual focus of battle activity. A previous interpretation places the battle focus about .3 miles to the east of Area F, with a corresponding extension of battle lines much further to the east than what we believe to be the case. Also, the relative concentration of Mexican-related artifacts located just south of Area F is especially significant. This concentration may reflect tactical instability of the final Mexican battle line. Tacticians have long noted the tendency for soldiers under fire to almost instinctively draw closer together. This tendency is termed "crowding". Crowding grows stronger as the distance from the enemy narrows, and crowding along a battle line increases exposure to enemy fire. Good leadership on the battle line will keep men properly spaced. However, if leadership deteriorates or is poor at the onset, crowding escalates as enemy contact increases, with men pressed together for protection as extreme fear develops (Du Picq 1946; Marshall 1978; Keegan 1978; In Fox 1993:33). At Palo Alto, we note the presence of regimental insignia of the Mexican First, Fourth, Sixth and Tenth regiments occurring within a ca. three acre area. The mingling of individuals from four regiments within such a small area suggests crowding occurred along the Mexican

battle line, a not surprising event given the fact that Mexican soldiers stood in static position for hours while under a galling artillery attack;

6) The broad prairie extending northwards from "Arista Hill" does contain a relatively widespread deposition of both U.S. and Mexican ordnance. Reportedly, a number of Mexican cupreous items, such as regimental badges and musket parts, were taken from this area by relic collectors; however no such items were recovered from this area as a result of the 1992, 1993 surveys. According to Plitt (1992) (see also Plitt Survey Area I, Figure 41, pocket insert), there once existed a heavy concentration of Mexican-related artifacts located approximately .3 miles east of where we believe the major battle activity took place. The author theorizes that artifacts found by relic collectors within this area of the battlefield were deposited when the Mexican army was retreating (as reported) in a southeasterly direction. Artifacts also may have been deposited here due to post-battle collecting of the dead and wounded by both sides, and perhaps due in part to post-battle Mexican encampment. Unfortunately, since relic collectors have compromised artifact patterning here, it may not be possible to better define this area; and

7) Recovered Mexican accouterments include a number of gun parts from the India Pattern musket and the Paget carbine, firearms recorded as typical general issue in the Mexican army. Also found were examples of military uniform items manufactured in Mexico as well as imported for use by the Mexican army. In addition to their value as identifiers of the Mexican battle line, such items are important towards broader research goals. For example, detailed analyses of manufacturing attributes of these objects provides some insight into the capabilities and limitations of Mexican light industries during this turbulent period of their history.

Discovery of the initial Mexican battle line should have been evidenced by a strong artifact patterning along a more or less east-west axis. In fact, no such patterning emerged as a result of this survey. Possible definition of this battle line may only result once surveys are allowed on property south of the 1992-1993 project areas. Little archeological evidence exists for the U.S. battle lines. The author attributes this negative finding largely to the fact the U.S. army experienced relatively little loss of men and equipment. Also, extensive land modification activities may have destroyed whatever artifact patterns existed there at one time. Nevertheless, one can make a good argument as to where the U.S. regiments were positioned largely based on documentary data, in association with provenience data from the few recovered U.S. artifacts.

Finally, evidence of flanking activity on the west end of the battlefield was not found. Probably such evidence does exist but is presently inaccessible due to heavy mesquite cover. Significantly, a local informant stated several Mexican Light Infantry belt buckles were recovered by a relic collector who favored working along the southern margins of this mesquite forest. Our survey of this particular area failed to produce any artifacts, possibly because the reported collector was thorough. Although anecdotal in nature, such information underscores the ongoing problem of battlefield depredation.

Recommendations

This most recent archeological study of Palo Alto resulted in the survey of approximately 8 percent of the entire 3,400 acre area of the park, with emphasis placed on sampling the approximate core battle area. These surveys indicate future field investigations should continue to employ a sample approach utilizing metal detectors. Use of metal detectors by skilled personnel is the most efficient survey approach, given that Palo Alto possesses a virtual absence of surface artifacts. Also, the dense vegetation cover inhibits the employment of other, conventional survey methods dependent entirely on visual surface inspections and shovel tests. The planning of future surveys within heavily wooded areas must consider the soundness of removing extensive stands of mesquite needed to conduct a statistically valid sample. One must decide whether such removal and consequent detriment to the environment is worth the large risk that nothing of consequence will result from its survey.

The battlefield undoubtedly is the single largest and most significant cultural resource of Palo Alto. However, one should not forget other cultural resources not directly related to this battle. Specifically, future research might consider focusing on identifying "Worth's Camp", the American army encampment of March 24-27, 1846 and located just east of Palo Alto pond. Worth's Camp may, or may not, be same location of the Mexican army that bivouacked at Palo Alto on May 3-5, 1846. This area could have been obliterated by land levelling activities; nevertheless, further research is warranted in this area of the park to make certain this is the case. Neither do we know where the Mexican army positioned its field hospital and baggage train, nor where it encamped the night following the battle. Also, Palo Alto was an ancampment site for American volunteers and regular soldiers both during and after the war. We know the approximate location of Palo Alto House, but we do not know the extent or complexity of the nascent community that began to develop around it until the community was abandoned in the early 1850s. Palo Alto is believed to have been home to a few homesteads; these need to be located and recorded as well.

Most important, a thorough historical documents research program addressing such research goals must be conducted prior to initiating any additional archeology within the park. Without the guidance of such documentation, archeological fieldwork becomes a wasteful lesson in futility.

During the Mexican-American War only two major battles took place within the present boundaries of the United States: Palo Alto and Resaca de la Palma. Other engagements occurred in Texas, New Mexico and California but were little more than skirmishes although significant if only on a local level. As a result of urban growth, Resaca de la Palma battlefield has virtually disappeared as a cultural resource, thus bestowing singular importance on the remaining battlefield located just up the road. In this light, "future Mexican-American War studies" would seem somewhat grandiose if necessarily limited to Palo Alto alone. Yet, during this war, over 20 major engagements occurred, most of which eclipsed Palo Alto in numbers of participants, areal extent of fields of operations, and complexities of applied tactics and logistics. These major battles all took place south of the Rio Grande. Therefore, it is indeed fortunate both Mexico and the United States are working toward the preservation of their respective Mexican-American War battle sites.

While this study has many purposes, one purpose it definitely does not serve is the final and incontrovertible explanation of what happened on the prairie of Palo Alto during the afternoon hours of May 8, 1846. There is ample room for additional research and analyses which, in turn, could lead to refinement, even radical reconstruction, of the hypothetical reconstructions presented here. This study provides a framework for further research; it is a starting point, not a conclusion.

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APPENDIX A

GLOSSARY OF TERMS

GLOSSARY OF TERMS

AIDE-DE-CAMP--Junior staff officer attached to a general.

ARM (of service)--Cavalry, infantry, artillery, etc.

BALDRIC--A shoulder belt, worn diagonally from shoulder to hip.

BALL--Musket ball or musket CARTRIDGE.

BALLISTICS--Science of projectiles in motion.

BATTALION--A military unit of two or more companies, but smaller than a regiment.

BATTALION COMPANY--"Center" company of an infantry battalion.

BATTERY--Originally a gun emplacement. By the mid-nineteenth century, this term referred to a company-size artillery unit equipped for mobile warfare with a variable number of guns, usually four to eight, depending on standardized method of artillery organization of a nationality or availability and expediency. See FIELD BATTERY.

BLOUSE--Smock-type garment.

BOMB--Mortar shell; loosely applied to all explosive projectiles.

BORE--Interior of a firearm and cannon barrel.

BREASTPLATE--Small badge worn on the shoulder belt.

BREECH--Rear or closed end of a firearm and cannon barrel.

BREECHLOADER--A firearm that receives its load at the breech.

BREVET--A commission to an officer that entitles him to a higher rank without higher pay.

BRIGADE--Military unit larger than a regiment and smaller than a division.

BRIQUET--An infantry sword; a type of HANGER.

BROWN BESS--Nickname applied to Long Land Pattern British muskets and later patterns, including the India Pattern musket.

BULLION--Gold or silver lace.

BUTT--Rearward portion of the stock of a firearm.

BUTT CAP--A metal cap used to cover and protect the butt of a pistol.

BUTT PLATE--A reinforcing plate used to cover and protect the butt of a shoulder arm.

CAISSON--Ammunition wagon accompanying mobile artillery.

CALIBER--Diameter of the bore of a cannon and firearm. For a cannon, this is expressed either as the weight of the solid shot, inches of diameter of the bore, or the diameter of the bore divided into the length of the tube. For a firearm, caliber is usually expressed in hundredths of an inch.

CANISTER SHOT--A tin projectile containing small shot.

CANNON--All tube artillery; includes guns, howitzers and mortars.

CAP--A small metal device containing a percussion-ignited compound designed to ignite the main charge of a firearm.

CARBINE--A shortened form of musket or rifle used by mounted troops.

CARRIAGE--Wheeled mount for a cannon.

CARTRIDGE--For firearms, the paper tube containing the lead ball and gunpowder, the paper used as wadding once its contents were poured into the musket or rifle barrel; for a cannon, the bag or case containing the propelling charge.

CASE SHOT--See CANISTER SHOT.

CAZADORE--Spanish term, same as light cavalry.

CHARGE--the propellant and round in a firearm and cannon.

COATEE--A short military coat, cut to the waist in front, with short tails that just covered the buttocks.

COCKADE--A rosette of national colors worn on hats and helmets.

COLOR SERGEANT--A top-rank, noncommissioned officer.

COMMISSARY--A supply officer; a military supply depot or dump.

COMPANY--Military unit smaller than a battalion.

CONE--A small tube of a percussion firearm on which is placed the PERCUSSION CAP.

CORPS--A tactical unit consisting of several divisions.

CUIRASS--Breastplate.

CYLINDER--The part of a multi-firing firearm holding a number of cartridges presenting the loads successively for firing, by revolution about an axis.

DIRECT FIRE--Fire against a visible target.

DIVISION--Military unit larger than a brigade.

DRAGOON--Mounted infantryman and forerunner of American cavalryman, the latter in use by the Civil War.

DUCK--A fine, bleached linen canvas, used for summer wear.

EPAULETE (Epaulette)--An ornamental shoulder piece. During this period, its shape, size and color were used to indicate the wearer's grade and branch of service.

ELEVATION--Angle formed between the axis of the cannon bore and the horizontal.

ELEVATION SCREW--Handscrew under the cannon breech for adjusting elevation.

ENFILADE-- Fire from a flank, raking the entire length of a formation.

ESCOPETTE-A short musket with a bell-mouthed or sawed-off barrel, used by Mexican mounted irregulars; also called a "scuppet" by U.S. soldiers.

ENSIGN--Infantry second lieutenant; a BREVET rank at the time of the Mexican-American War in the U.S. Military.

FACINGS--Lapels, cuffs and collars of a uniform coat that were covered or "faced" with a different color than the coat. The colors used often indicated the regiment or service branch of its wearer.

FIELD BATTERY--A company of artillery equipped with guns, horses and vehicles to serve as field artillery; a specific term used to emphasize the difference between such a unit and a conventional, less mobile BATTERY.

FIELD OFFICER (or Field Grade Officer)--A major, lieutenant colonel or colonel.

FIXED AMMUNITION--Propellant and projectile complete as a single unit; artillery projectile with a wooden SABOT affixed.

FLINT--A hard quartz variety stone, possessing fracture properties for a sharp edge, and for producing sparks when the edge was struck against steel.

FLINTLOCK--A firearm equipped with a gunlock in which the impact of a piece of flint against steel produced sparks to set off the priming.

FOOT ARTILLERY--An artillery unit in which only the officers, senior noncommissioned officers (NCOs), trumpeters and drivers were mounted, the other enlisted men marched on foot.

FOREARM--The part of the stock in front of the trigger guard extending under the barrel towards the muzzle.

FORAGE CAP--A light soft leather or cloth cap worn with the undress uniform; same as a barracks cap.

FRIZZEN--The upright, pivoted part of the flintlock mechanism against which the flint struck to produce sparks; also termed "battery".

FROG--A short sheath attached to a belt, designed to hold a scabbard.

FULL DRESS UNIFORM--The showy uniform worn for parades and other military ceremonies.

FURNITURE--Metal fittings on a musket or rifle.

FUSE--Device to detonate a shell or other weapon.

FUSIL--Light musket.

GAUGE--The diameter of the bore of the firearm expressed in the number of spherical balls of corresponding size to the pound. For example, 16 gauge indicates a diameter that would take a round ball of the weight of 16 such balls to weigh a pound.

GRAPESHOT (Grape)--A type of artillery ammunition consisting of metal balls, the number and diameter depending on the caliber of the gun, placed in a canvas bag and tied to form a rough cylinder that fitted the gun's bore. The metal balls used in canister rounds also were informally called grapeshot, although of smaller caliber and greater number. By the early nineteenth century, true grapeshot was reserved for use by Navy and coastal artillery since it was found that CANISTER was more effective for field artillery.

GREAT COAT--An overcoat. During this period, it was usually long and had a cape.

GUN--Long-barreled cannon with a characteristic high muzzle velocity and flat trajectory.

HANGER--A short, heavy cutting sword with a curved blade; generally an infantry weapon.

HAVERSACK--A canvas or heavy linen bag used in the field for carrying rations. Soldiers usually carried the bag over the right shoulder so that it rode the left hip and thus did not interfere with the cartridge box.

HORSE ARTILLERY--An artillery unit in which all men had personal mounts. It, therefore, could move rapidly enough to keep up with cavalry.

HOUSINGS--Horse trappings.

HOWITZER--Short-barreled cannon with a characteristic high angle of fire.

INDIRECT FIRE--Fire against a target not visible from the cannon.

JACKET--A term synonymous with WAISTCOAT or VEST; also a short coat with sleeves.

KERSEY--A coarse woolen cloth, usually ribbed.

KNAPSACK--A infantryman's pack; in the Mexican Army, it was made of cowhide with the hair left on the outside; in the U.S. Army, the knapsack was made of heavy canvas, varnished to make it waterproof.

LACE--Flat braid used for trimming lapels, cuffs and other portions of the uniform.

LANCER--Light cavalryman armed with a lance.

LIGHT ARTILLERY--During this period, a very loose term applied to either foot or horse artillery; field artillery as compared to fortress or siege artillery.

LIGHT INFANTRY--Troops selected for agility, marksmanship, courage and reliability; used for advance guard operations, raids and skirmishing. In some cases, they were issued lighter weapons and equipment.

LIMBER--Two-wheeled, horse-drawn vehicle for pulling gun carriages or caissons.

LINE--A term describing ordinary infantry, cavalry, etc.; meaning "infantry of the line of battle".

LINE OF SIGHT--Straight line from the muzzle of a piece to the target or point of impact.

LINSTOCK--An artilleryman's implement; a staff three feet long with a forked iron head to hold a slow match; used to fire a cannon.

LOCK--The mechanism of a firearm; the function was to ignite the explosive.

LONGARM--A classification name for the longer type of smallarms, such as muskets, rifles and carbines.

MAGAZINE--Storage space for munitions; a supplementary container for musket or rifle ammunition carried on the individual soldier.

MINIÉ BULLET--An elongated bullet with a cup-shaped hollow in the base which, when expanded by the action of the gases, causes the bullet to take the rifling. Named after C.E. Minié, Captain of Infantry, French Army, to whom the invention of the system is credited. The minié was adopted by the U.S. Army in 1855.

MORTAR--Very short-barreled cannon with a low muzzle velocity and a very high trajectory.

MUSKET--A smoothbore barrel shoulder arm.

MUSKETOON--A shortened musket, commonly used by artillerymen and some mounted units.

MUZZLE--The end of the barrel from which the bullet leaves the arm.

PAN--The receptacle for holding the priming charge for a flintlock.

PARK--Artillery reserve.

PATCH--A leather or cloth wrapper, usually greased, used around the bullet of rifled muzzle-loading arms to facilitate loading.

PERCUSSION CAP--A small metal, cup-shaped device charged with fulminate or other percussion-ignited compound, and placed on the cone of a percussion arm. When struck by the hammer, the explosive compound was ignited by the blow, and the flash was transmitted through the hollow cone to the main charge in the barrel.

PERCUSSION WEAPON--A firearm with a gunlock that fired by striking a percussion cap, a small metallic cap containing a fulminating powder. It replaced the flintlock during this period.

PIECE--A firearm, including any cannon.

PICKET (derived from the French *piquet*)--Infantry or light cavalry outpost.

PLASTRON--Colored chest-panel on a jacket.

POINT-BLANK--Coincident point of the TRAJECTORY and LINE OF SITE.

PORTFIRE--A tube, usually of thin metal, containing a quick-burning PROPELLANT, such as alcohol mixed with gunpowder. It gradually replaced the linstock during the late eighteenth and early nineteenth centuries.

PRICKER--Wire needle used for clearing musket touch hole.

PROJECTILE--Portion of a ROUND intended for delivery to the target; cannonball, musketball.

PROPELLANT--Explosive charge; gunpowder in a ROUND of ammunition.

RAMROD--A wooden or metal rod used for ramming down the charge of muzzleloading arms.

REGIMENT--Military unit larger than a battalion and smaller than a brigade.

REGULAR ARMY--The permanent Army of the United States, maintained in peacetime as well as during war; the "Standing Army".

RIFLE--A shoulder-fired longarm with a rifled small caliber barrel.

RIFLE MUSKET--A term used by the Ordnance Department in mid-nineteenth century to designate the new musket size rifled arms and long slim rifle caliber barrels.

RIFLING--Grooves cut in the sides of the bore, or the process of cutting such grooves.

ROUND--One complete load of ammunition for one piece.

SABOT--Wooden block on artillery FIXED AMMUNITION.

SABRE (or saber)--A curved cavalry sword; a cavalryman, for example, "a regiment of 800 sabres".

SAPPER--Originally one who dug narrow siege trenches; later the generic term for engineers; see ZAPADORE.

SCALES--A type of shoulder knot made of brass scales. During this period, worn only by mounted troops.

SCHABRAQUE (Shabrack)--A cloth cover fitting over the saddle and saddle blanket; ornamental HORSE FURNITURE. In the United States mounted service it was used mostly for full-dress ceremonies, but the Mexican mounted service used them in the field.

SEMI-FIXED AMMUNITION--One complete round with adjustable components, such as a powder charge.

SEPARATE LOADING AMMUNITION--Powder cartridge and projectile independent of each other.

SHAKO--A cylindrical military cap, made of felt and leather. It originated in Austria and was adopted by England, France, Spain, the United States, Mexico and other nations as standard infantry headgear by the early nineteenth century.

SHELL--Hollow PROJECTILE containing powder and fused to detonate.

SHELL-GUN--SHELL-firing CANNON or HOWITZER.

SHOT--Spherical PROJECTILE.

SIEGE TRAIN--Heavy artillery, for besieging fortresses and fortified towns, accompanying an invading army. It normally marched with the baggage train.

SMOOTHBORE--A firearm whose bore is not rifled.

SPADROON--Light, straight bladed sword.

STANDARDS--The flags of a cavalry regiment.

STEEL--See FRIZZEN.

STOCK--The wooden part of a firearm; also a wide, stiff neck covering.

SWIVEL--A mechanism permitting motion on a part of an arm so that it remains a part of the piece, for example, a "swivel ramrod", a ramrod attached to the arm yet capable of the movement required for loading.

TRAIL--That part of a CANNON CARRIAGE resting on the ground.

TRAIN--Troops responsible for driving transport, artillery, etc.

TRAJECTORY--Path of a PROJECTILE in flight.

TRIGGER GUARD--The frame placed about the trigger to minimize the possibility of accidental discharge by unintentional pressure on the trigger.

TRIGGER PLATE--The metal part of the firearm through which the trigger projects.

TUBE--The cannon, synonymous with barrel.

UNLIMBER--Unhitch from LIMBER and prepare to fire.

UNDRESS UNIFORM--A uniform worn for normal military duties; less showy but more comfortable than FULL DRESS.

VALISE--A leather case carried behind the cantle on the saddle to hold a horseman's cloak and other articles.

VENT--A small hole, tube or channel used to convey the flash of the ignited priming from the exterior of the BREECH to the main CHARGE in the chamber.

VOLTIGEUR--A French term for a light infantryman, introduced during the Napoleonic Wars. The name was borrowed for the Tenth Infantry Regiment with one horse for each two men, permitting doublemounting for rapid movement. Early plans to give it a special organization, uniform and equipment fell through. Eventually, this regiment actually differed from other regular U.S. infantry regiments only in its name.

WAD--The paper, felt or other material used to retain the CHARGE in the barrel of a firearm and cannon, or in a cartridge.

WORM--A twisted, corkscrew-shaped metal device used on the end of a ramrod in withdrawing the CHARGE in muzzle-loading arms.

ZAPADORE--The Spanish word for "sapper". Zapadores were elite troops in the Mexican Army.

APPENDIX B

Human Skeletal Remains from the Battle of Resaca de la Palma

Eric A. Ratliff
Department of Anthropology
University of Texas
Austin, Texas

Human Skeletal Remains From the Battle of Resaca de la Palma

To examine a human skeleton is to look into the past history of that individual, from both cultural and biological standpoints. This sample of human remains from the Mexican-American War is unique because of its historical significance, as these people all died during the battle of Resaca de la Palma on May 9, 1846. In addition to what we can learn about the battle from this grave site, we also can discover more information about the Mexican soldier, and the people of Mexico from this period in general. Little is known about the individual in the Mexican military from this period. Few personal accounts of the war from the Mexican perspective were written due to illiteracy, and, perhaps, the reluctance of people to write about defeat. What follows is a description of the battle, an analysis of the remains of soldiers killed in combat, and a look at the information we obtained from this archeological site.

Battle Summary

After the battle on the plains of Palo Alto, approximately seven miles north of the Rio Grande (then called the Rio Bravo), General Mariano Arista directed the Mexican army south into the thick chaparral before daybreak on May 9, 1846. With reinforcements from Mexico, his troops numbered between 5,000 and 6,000 at Resaca de la Palma. The U.S. army, of approximately 2,200 soldiers, followed to prevent them from regrouping and mounting a counterattack. Initially, Gen. Zachary Taylor sent small parties into the brush to find the enemy while he waited for the long wagon train to catch up with the infantry. After all the U.S. troops had assembled by four p.m., the artillery continued southward along the road with infantry on either side, heading toward the Mexican army positioned in the dry river bed. The U.S. attack focused on the western flank, with the Mexican artillery set up on both sides of the road (Figure 64). Fighting was fierce; the chaparral precluding an organized attack or defense. Assaults by U.S. dragoons silenced the Mexican artillery batteries, and the Mexican troops pulled back in disarray. Arista's camp was quickly captured, and the town of Matamoros was soon filled with wounded Mexican soldiers.

Many eyewitness accounts tell of the human destruction at Resaca de la Palma; official reports describe 262 Mexican dead on the battlefield, while noting many more died while trying to cross the Rio Grande (U. S. Congress and Senate 1846). This number probably is the number of dead the U.S. soldiers buried the day following the battle. See Barbour (1936) and Frost (1849) for descriptions on the disposal of the dead.

There were other reports following the war that describe the graves of the fallen soldiers. On March 18, 1848, Helen Chapman passed through the Resaca de la Palma area, noting:

> One of the long beautiful green vistas... [was] pointed out by Major Scott as the scene of the deadliest fighting. As we rode down to the spot, all along in relief against the green grass, were the blackened bones of horses and men, fragments of shoes, of woolen cloth, of harness, of capes, fertile proofs of a deadly encounter. They were mostly Mexicans who fell in that line and there they remained unburied, some were buried by our soldiers and some remained where they fell (Coker 1992:29).

Many view the battle of Resaca de la Palma, along with the fighting at Palo Alto, as one of the most decisive in military history, propelling the United States into a dominant position in the world.

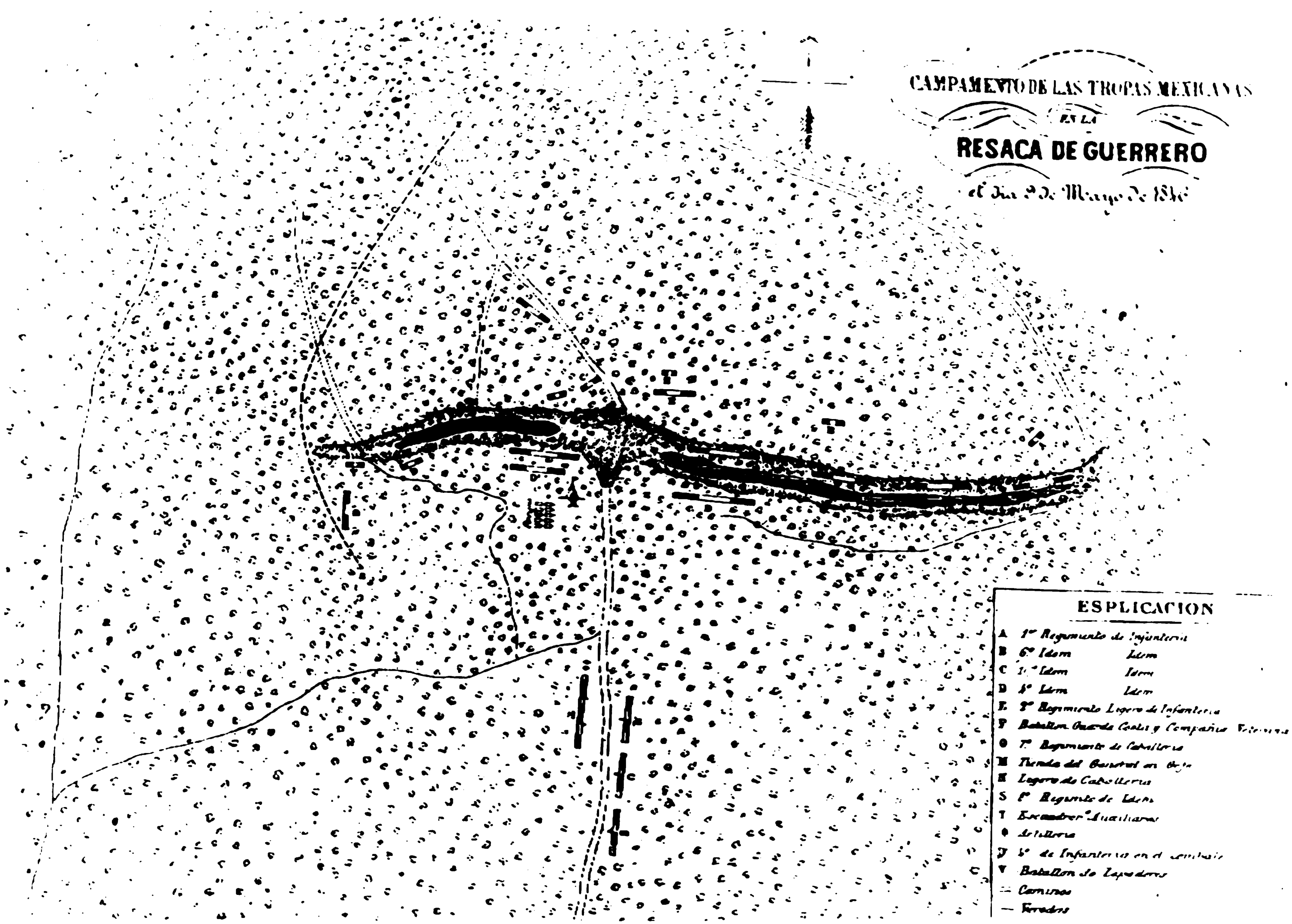
CAMPAMENTO DE LAS TROPAS MEXICANAS
EN LA
RESACA DE GUERRERO
el Dia 9 de Mayo de 1846
ESPLICACION
A 1º Regimiento de Infanteria
B 6º Idem Idem
C 10º Idem Idem
D 4º Idem Idem
E 2º Regimiento Ligero de Infanteria
F Batallon Guarda Costas y Compañias [illegible]
G 7º Regimiento de Caballeria
H Tienda del General en Gefe
K Ligero de Caballeria
S 8º Regimiento de Idem
T Escuadron Auxiliares
Artilleria
J 2º de Infanteria en el [illegible]
V Batallon de Zapadores
Caminos
Veredas

Figure 64. Battle map of Resaca de la Palma (also called Resaca de la Guerrero by Mexico). From *Compaña Contra de los Norte Americanos* (1846).

However, there is much more to history than simply the events presented in textbooks, as the actions of many people bring about these changes. Often, the stories of the principle actors remain untold. There are many accounts from the view of the U.S. soldier (cf. Barbour 1936; Brooks 1849; Frost 1849; Henry 1950; Henry 1847; Wilcox 1892), but the story of those who gave their lives for the Mexican cause was buried in south Texas. For 121 years, the battlefield was silent.

Discovery and Archeology

On April 1, 1967, during construction of a housing project in north Brownsville, Texas, machinery uncovered human remains. Three graduate students from the University of Texas at Austin (Michael B. Collins, T. Z. Ellzey and Thomas Hester) excavated the site over the next six days. This was only one of the mass graves in the area, but the contractor decided to ignore them after seeing how long it took the archeologists to excavate one grave; he covered over the others. Looting at the site also was a problem, with a number of items taken by interested locals. The archeologists removed a total of 30 separate burials, along with many commingled remains. The skeletal material and artifacts were then transported to the University of Texas and examined by other archeologists and physical anthropologists, including Al B. Wesolowsky. However, no report developed from these preliminary studies.

While examining the collections at the Texas Archaeological Research Laboratory (TARL) in Austin, this researcher came across the remains from Resaca de la Palma, noting that they had not been studied in over twenty years. What follows is a description of my examination methods, and what has been learned from the soldiers of Resaca de la Palma.

Analysis of Human Remains and Artifacts

To begin this investigation, each of the individual burials were examined according to standard forensic procedure (Bass 1987). Additionally, a new set of guidelines was used that standardizes the study of human remains (Paleopathology Association 1991). After preparing an inventory of skeletal elements, the age, sex and stature of the individual were estimated according to established criteria outlined below, along with details on the skeletal pathology observed in the remains.

Since most of the burials are incomplete, information on individuals is lacking in some cases. In addition to the primary burials excavated as distinct features, there were hundreds of bones unidentifiable with any of the primary burials. Trying to associate commingled remains with a particular individual was a frustrating exercise since there are few excavation notes, and only one weathered drawing that shows the position of the remains as they were excavated. With this drawing, and a large laboratory space (the grave measured approximately 14 ft x 10 ft), it was possible to lay out the burials in the position in which they had been found (Figure 65). An attempt was made to match some of the unassociated remains with the primary burials but with limited success. The remains are well preserved, and although only arms or legs remain for some individuals, it is still possible to describe certain aspects of their lives.

Trying to evaluate the age at death from a skeleton now involves a battery of observations to obtain the best estimate. Traditionally, the closing of the growth plates in the long bones (Stevenson 1924), and the physical form of the **pubic symphysis** (point where the pelvic bones join in front) have been the most widely used techniques for assessing age (Gilbert and McKern 1973; Katz and Suchy 1986; Meindl et al. 1985), but preservation of the pubic region is often poor, and various other structural changes, with no correlation to age, may affect this observation (Stewart 1957). As a result, researchers developed other methods that use other portions of the pelvis (Lovejoy et al. 1985),

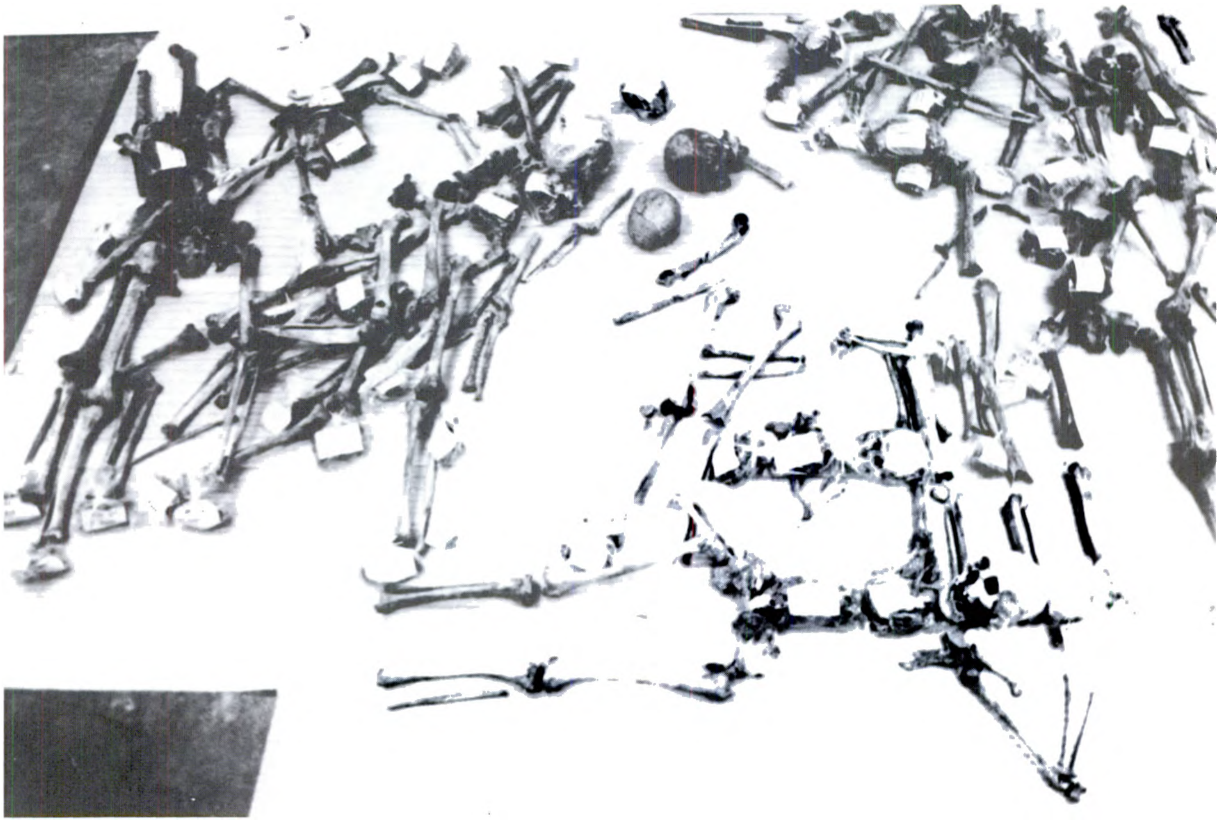

Figure 65. Skeletal remains, from Mexican mass burial at Resaca de la Palma.

the ribs (Iscan et al. 1984; 1985), and the fusion of bones forming the **maxilla**, or upper jaw (Mann et al. 1991). When possible, data from several procedures are averaged to provide the age for a complete skeleton. However, with fragmentary remains, usually only one, if any, technique is available for reaching an absolute number. Also, it is important to look at other skeletal features for a relative assessment, such as the tooth wear that takes place in a person's life, or the "normal" development of arthritis with age, particularly in the spine.

The sex of an individual is somewhat easier to determine if the pelvic bones are recovered, but other methods also are used for incomplete skeletons, such as overall bone size and the size and structure of muscle attachments (Bass 1987; Steele and Bramblett 1988; Stewart 1954; Workshop of European Anthropologists 1980). As with estimating the age of a person's remains, many observations are needed to evaluate the sex of a skeleton.

Stature estimation requires the presence of complete long bones, preferably those of the leg. Measurements are taken according to established guidelines (Bass 1987; Moore-Jansen and Jantz 1989), and used in a formula developed for the population in question. In this case, the ratios of bone lengths and formulae developed by Genoves (1967) for Mesoamerican peoples was used.

In addition to demographic analysis, noting the anomalies of each skeleton possibly resulting from events specific to each individual's life also is important. These include: genetic variation; intentional modification, such as dental work; and injuries, disease and normal processes associated with aging. All of these are usually grouped together under the description of **pathology**. The focus of this analysis was on four basic categories of pathology: dental; traumatic; degenerative; and inflammatory.

Dental pathology includes caries (also known as cavities), abscesses and various types of malformations. These can provide information on diet and skeletal development, and wear patterns are indicative of cultural practices regarding food preparation and other means of tooth use. Congenital defects and variation also are used to denote population affinities.

Traumatic pathology is simply physical injury to the skeleton. This is most apparent in bone fractures, but also can be seen in the various attachment sites, where stress can pull ligaments and tendons away from the bone. This may be indicative of repeated activity, but the more serious injuries usually are those resulting from a single event.

Degenerative pathology normally occurs within the skeleton as a result of aging. Arthritis is the main affliction observable in bones, usually in the form of **lipping**, or the development of a bony rim along the margin of the joint surface. In the most severe cases, the bones may fuse together. Arthritis also is an excellent indicator of habitual body movements since more stress causes greater wear on the joint surfaces.

Inflammation of bone tissue may be caused either by infection or injury. **Periostitis** is a general term used to describe the inflammation of the bone surface, and is fairly common in most skeletal samples, particularly in the lower leg bones (tibia and fibula). Usually, the presence of periostitis signifies a chronic process, as do most skeletal pathologies, but the rapid spread of infection can result in extreme changes to bone structure over a short period. Swelling of the bone, with a porous appearance from increased blood vessel development in the area, characterizes both types. Evidence of healing is apparent in the smooth external texture of the bone in some cases, while a lesion active at the time of death presents a more brittle appearance.

In addition to the skeletal remains, many artifacts also were uncovered during the archeological investigation. Unfortunately, the most distinctive item was not part of the actual excavation: a belt breastplate from the Mexican Tenth Infantry was found by one of the construction workers, and photographed before removal from the area. However, many more items were certainly lost to looting. Another important find was a hunting horn emblem from the headgear of a soldier. Other items from the equipment of the regular army include scabbard tips, and several types of metal buttons. However, most of the recovered artifacts are from the clothing of irregular troops, generally Indians from the surrounding area or other parts of Mexico. Approximately 80 percent of all artifacts are buttons made from animal bone, with several different styles reflecting individual artistry (Figure 66). Some fragments of cloth also were preserved, and in the neck area of many individuals small metal hooks and clasps were found. These material objects provide additional information on those who died on this battlefield, and provide a cultural framework for evaluating the physical remains of these people.

The Primary Burials

Presented here are summaries of the 31 primary burials identified during excavation and subsequent analysis. Most of the primary burials are incomplete and some contain only a small portion

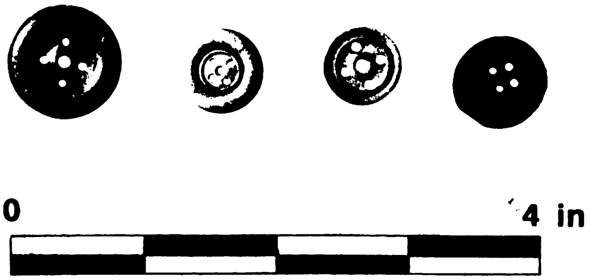

Figure 66. Bone buttons, from mass burial at Resaca de la Palma.

of the whole individual, such as a pair of legs or a skull. Yet each burial represents a person who lived many years ago, and thus provides an account of their existence in that time and place.

RES 0

Only the fragmented remains of the right arm, portions of the pelvis and both legs remain of this individual. These appear to be from a male, and no age assessment was possible. The only pathology evident was swelling on the left tibia (lower leg bone), covered by healed periostitis. The inner surface of the right tibia has a similar lesion.

RES 1

These remains are from an elderly (over 50 years old at death) woman. This fairly complete skeleton is missing only the ribs and vertebrae. Scars on the pelvic bones indicate she gave birth to at least one child during her life. Her postcranial skeleton is generally robust, with well-defined muscle attachments. As typified by advanced age and a coarse diet, the teeth show wear, almost to the dental roots; several were lost during her life.

Many of the abnormalities observed in this skeleton relate to her advanced age. Arthritis, exhibited by the formation of bone along the margins of the joint surfaces (lipping), affected her knees, elbows and fingers. Other pathologies observed are not as common in older people, but are indicative of an active individual. There is a healed fracture on one of the foot bones, and periostitis on the bones in the lower leg and forearm that probably were caused by an infection.

RES 2

Very few of the bones found on the eastern edge of the excavated site are attributable to this individual. Those present include cranial fragments, along with portions of the several long bones and the right pelvis. The pelvis is from a male, approximately 25-30 years of age. As with many of the remains from the lower limbs of other individuals, there is a layer of periostitis on the right **femur** (upper leg bone). Notable also is a green stain on the shaft of the left tibia, resulting from decay of a cupreous object. These remains were found in a very jumbled state and probably were part of another incomplete primary burial.

RES 3

These fragmentary remains of an individual uncovered by construction machinery at the site could be from another female. The remains are very brittle, having been closest to the surface, and there is evidence of rodent gnawing on the leg bones. The estimated age is 35-40 years, based on the auricular surface of the pelvis, and moderate dental wear. Other dental defects include a carious lesion (cavity) on the right first molar of the **mandible** (lower jaw), and an abscess at the roots of the second incisor and canine in the same quadrant.

Slight arthritic lipping on the margins of the femoral condyles (knee) and left femoral head (hip) also indicate an older individual. There also is evidence of a torn ligament on the left tibia at the knee. This is the region where the anterior cruciate ligament and the **lateral meniscus** (cartilage) attach to the bone, a strain of which would result in knee joint weakness, and probably caused a great deal of pain.

RES 4

The remains of this male, 30-35 years old, are among the most complete recovered from the site, with only the feet and **patellae** (kneecaps) missing. Dental wear on the front teeth is moderate (slight on all others), and three of the third molars are congenitally absent, with the fourth having a large area of decay on the front half. His estimated height is approximately 159cm (63 in), using the formula developed by Genoves (1967).

A healed compression fracture of the left **mandibular condyle** (where the jaw meets the skull) caused shortening and flaring of the jaw outward, resulting in temporo-mandibular arthritis. The injury was caused by a blow to the right side of the face, driving the left side of the jaw upward into the skull. There also is healed periostitis on the lower leg bones. Depressions from **Schmorl's nodes** are on the upper surfaces of two vertebrate bodies from the middle back. This results from swelling in the intervertebral disc which pushes outward into the vertebrae, and, in severe cases, the disc may rupture. Repeated loading on the spine may result in a chronic inflammation of the disc over time, or a single traumatic incident also could result in a similar pathology. Without any apparent changes related to trauma, it probably is the result of a long-term back problem.

RES 5

Another relatively complete individual, this person was most likely female due to the small dimensions of the upper arm, or **humerus** (see Bass 1987:153-155 for sexing criteria using the humerus), and the small size of the postcranial remains. The estimated age is 20-30 years based on rib changes in the chest region. Her estimated height is approximately 160cm (63 in).

Dentition reveals a small cavity on the outer surface of the left mandibular second molar, and an abscess at the root of the right mandibular first molar. Antemortem loss of the two middle mandibular incisors and the right outer incisor probably is the result of trauma (the left maxillary middle incisor also is missing after death). Pathology on postcranial remains includes an anterior compression fracture on the body of the first lumbar vertebra, and another compression fracture of the distal left **ulna** (forearm bone).

This individual also has a particular lesion on the foot bones related to repeated stress. The articulation between the third metatarsal and the lateral (third) cuneiforms has an erosive lesion on the **plantar** (toward the sole of the foot) margin of both surfaces; this appears to be a tear of the plantar tarso-metatarsal ligament.

RES 8

Approximately half of the skeleton was found in this primary burial. Pelvic shape and muscle attachments indicate a male, approximately 20-29 years old. Stature of this person was approximately 158.5 cm (62 in). The lowest vertebra (5th lumbar) is fused to the pelvis, and there is evidence of arthritis in the feet. Green staining on ribs again indicates contact with a cupreous object.

RES 9

This burial included a left leg and arm, pelvis, chest area, and part of the skull. The remains are of a male who was 30-35 at death. In addition to a cavity on the left maxillary second molar, this person also had an active periostitis lesion on his left tibia. Unlike the previously mentioned cases of healed periostitis, the bone growth on the surface appears brittle, signifying an active infection or recent trauma to the area.

RES 10

The few remains from this individual consist of the cranium and right arm, and probably a female, based on humerus size and muscle attachments. She was 20-25 years old with almost no dental wear, and the maxillary sutures unfused. No pathology was apparent on the few elements present. However, one third molar is small and "peg" shaped, unlike the usual large square molar form. This aberration is genetic, undoubtably related to the congenital absence of the other three third molars in this individual.

RES 11

This is a male, 25-30 years old, the remains consisting of elements from above the waist: cranium, arms, ribs and vertebrae, plus the right foot. According to the size ratios of the arm bones (Genoves 1967), this individual was between 153-161.5 cm (60-64 in) in height. Dentition shows two small cavities on the lower right first molar, and another larger area of decay on the back of the lower left third molar. Several areas of trauma are present:

1) healed fracture of right nasal bone;
2) depression on the skull, directly behind the left ear;
3) healed fracture of the left **clavicle** (collarbone); and
4) two sets of fused **phalanges** (toes) from the right foot.

Additionally, there is evidence of arthritis in several of the vertebrae from the **thoracic** (middle) region of the spine, and a separation of the neural arch surrounding the spinal cord from the main body of the lowest vertebra (5th lumbar).

RES 12

This is a relatively complete skeleton, of a male, approximately 20-25 years old. His height was about 160 cm (63 in). Green stains are present on the front of the lower vertebrae, and the back side of the right femur. Pathology in this individual relates to mechanical stress of several hand joints, as evidenced by slight arthritis (lipping). Also, there is an area on the back portion of the right femur directly above the knee that has a rough, eroded appearance. This is an attachment point for the large calf muscle on the lower leg, the attachment partially pulled from the bone.

RES 13

This primary burial only consists of a reconstructed skull and dentition. It is probably from a male, approximately 30-35 years of age, as indicated by large muscle attachments, dental wear and suture closure. Two cavities are present on the upper left first molar, and a healed fracture of the left nasal bone.

RES 14

Only the lower limbs, pelvis and vertebrae make up this primary burial, and includes several bones labeled RES 1 after analysis in 1967. The remains are those of a male, aged 30-35 years, with an approximate height of 165 cm (65 in). There are cupreous stains on the back of several thoracic vertebrae (5th-8th). Arthritis is evident in the clavicle, and the lower vertebrae (3rd-5th lumbar). Both tibiae show healed periostitis along the bone shafts.

RES 15

A left arm and leg, the lower portion of right leg, the pelvis, vertebrae and the ribs represent this older male aged 30-35 years. He was roughly 165 cm (65 in) tall. There are cupreous stains on several of the rib fragments. Vertebrae show signs of arthritis, not unusual in a person of this age, and several depressions (Schmorl's nodes) on several thoracic vertebrae (7th-10th). The right fibula (small lower leg bone) appears swollen, with healed periostitis on its surface. This individual also has a wound related to the battle of Resaca de la Palma: a large lead projectile embedded in the right tibia just below the knee (Figure 67). The projectile is slightly deformed, its caliber not identifiable.

RES 16

Both arms, the right leg, ribs and vertebrae make up this primary burial. This male, 25-30 years old, has an estimated height of 166 cm (65 in). There is a large cupreous stain on the front side of the lower right femur. Extensive trauma during his life is apparent in the left shoulder region. The first and second ribs were broken some time during his life, and then healed together, with a fragment of the second rib joined to the first. The corresponding clavicle also shows an attachment where the muscle pulled away from the bone.

RES 17

Skeletal remains are fragmentary, consisting of portions from the skull, pelvis and several vertebrae. This individual was a male, 25-30 years old. The only evidence of pathology are Schmorl's nodes on two of the vertebrae (9th thoracic and 4th lumbar).

RES 18

Fragments of the skull and lower jaw with teeth are all that make up this burial. This probably is a male over 30 years of age.

RES 19

This primary burial occurred on the eastern edge of the excavation unit, and only the lower limbs and fragments of the arms and pelvis were recovered. The eastern limit of the site is a pond formed by one of the resacas, so the upper body probably was displaced at an earlier date. The remains are those of a male, 25-30 years old, standing about 163 cm (64 in) tall.

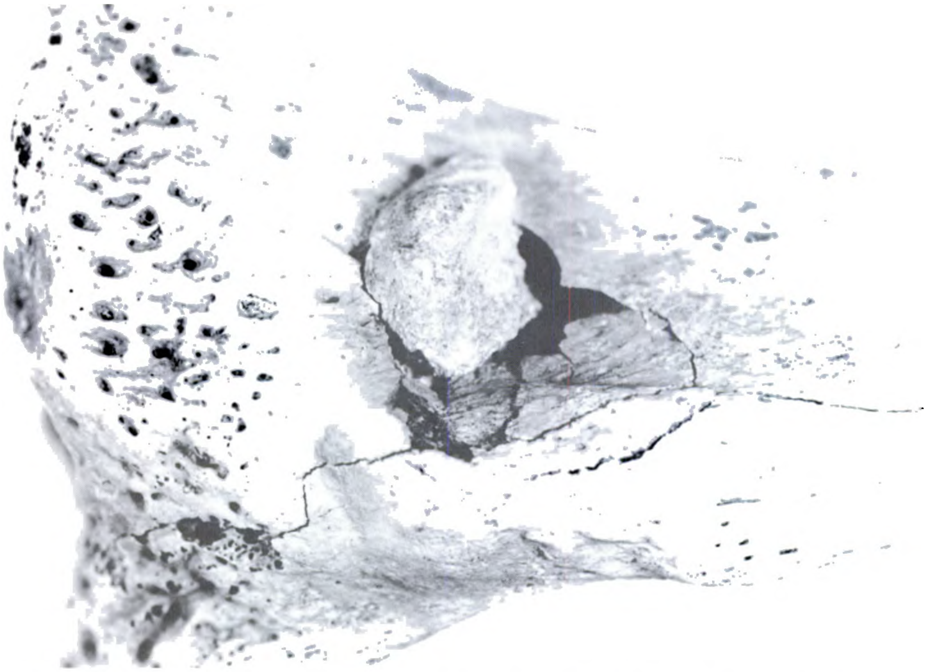

Figure 67. Tibia of RES 15 from mass burial, showing imbedded lead ball.

RES 20

Only the bones from the legs and hands remain of this adult individual; therefore, no sex or age estimate is possible. Extensive trauma to the left hand is apparent, with a fracture to the shaft of the second metacarpal, with fusion of the phalanges of the third digit, and slight arthritis (lipping) on the phalanges from the second digit and several **carpals** (wrist bones). There also are several healed areas of periostitis on both femora, the right tibia and fibula.

RES 21

Only the right arm, vertebral and rib fragments, and a portion of the mandible are present from this burial. From the size and muscle attachments of the humerus, probably from a male. There are two cavities on the right mandibular third molar. Pathology related to arthritis is apparent on several thoracic vertebrae (8th-11th), with corresponding Schmorl's nodes on the same bones.

RES 23

Both legs and the left hand, probably those of a male, approximately 155 cm (61 in) tall, compose this burial.

RES 24

Included in this burial is a humerus that initially was labeled "RES 22". Only the legs and left arm are present, with some foot bones and fragments from the pelvis. No sex or age estimate is, therefore, possible. Of note is the trauma to the right ankle area. There is a healed fracture of the lower tibia, with corresponding arthritis in the foot bones from this old injury. The foot bones also show trauma exactly like RES 5, that is, ligament tear between the third metacarpal and third cuneiform in both feet.

RES 25

Only the legs and several foot bones comprise this burial. The right femur has an area on the back surface where the large hamstring muscles seem to have pulled the bone away from the shaft at the attachment site. This probably is the result of a fracture, as there also is an outward displacement of the upper portion of the bone. Infection subsequent to the trauma also is visible as periostitis on the femur and corresponding tibia.

RES 26

Only lower leg bone (tibiae and fibulae) fragments were assigned to this primary burial.

RES 27

A skull, both legs, right foot and the lower left arm comprise this burial. The skull, initially labeled "RES 3" but not from the same burial as RES 3, was included in this primary interment. The remains probably are those of a male, age 25-30. There is slight arthritis (lipping) in the ankle area.

RES 28

These remains, probably male, consist only of both legs and feet, along with the right arm. His estimated height is approximately 169.5 cm (67 in). There is a healed fracture of one of the toe bones, and the joint surfaces on the femur that make up the knee have a flattened shape, "locking" the knee in an extended position more readily than normal. Also present is a cut mark 24 mm (.90 in) long on the right humerus just above the elbow (Figure 68). It is unlike other bone breaks caused by excavation or some other disturbance after burial, and appears to be the result of a blow from a sharp instrument such as a sword or bayonet. Its position on the back side of the elbow is consistent with the defensive position taken by a victim--his arm raised above his head in an effort to block the attack.

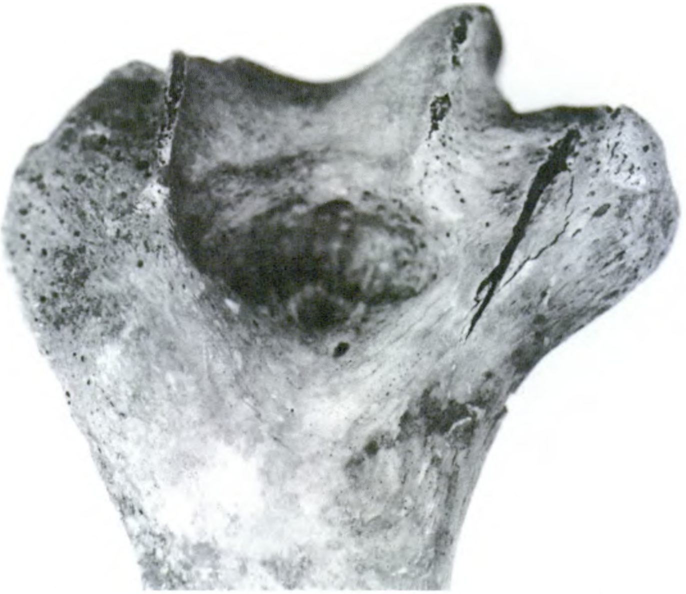

Figure 68. Humerus of RES 28, showing sword or bayonet cut.

RES 29

Fragments of the right humerus, pelvis and leg bones are all that remain of this male.

RES 30

Only the legs, with assorted hand and foot bones, were recovered for this person. A green stain is present on the left femur. Severe swelling and healed periostitis is present on all leg bones, indicating an infection that spread throughout the skeleton.

RES 31

Remains of this male consist of the left arm, both legs and the pelvis; and all are in fragmentary condition. Both femora show healed periostitis, with a swollen and more severely affected right fibula.

RES 32

Only fragments of the left leg and pelvis are present for this burial.

RES 33

Analysis of this individual only occurred after combined extra leg bones initially assigned to RES 9 and RES 19 were reassigned. From their large size, they appear to be those of a male approximately 162.5 cm (64 in) in stature. The right femur shows a well-healed fracture, with subsequent infection.

An Osteobiography of the Combatants

From this study, a physical record of a person's life that may be indicative of particular historical or cultural effects on the individual, has emerged. A skeleton reveals past injuries, diseases and activities, and the researcher interprets these according to similar observations of other skeletons, along with information about life for the people of that particular time and place. The purpose of this narrative reconstruction is to show the information obtained from the study of skeletal remains, and how this knowledge uncovers aspects of personal lives not reflected in the annals of history.

As with almost every other battle site, the remains from Resaca de la Palma are primarily those of male combatants (21 of 25, or 84 percent, of those burials whose sex was determined), with ages ranging between 20-40 years. One unusual feature of this skeletal sample is the number of female remains present. There are four primary burials identified as female (RES 1, RES 3, RES 5 and RES 10). Modern biases toward women in combat make this discovery difficult for many to accept, but as noted by Salas (1990), women were an integral part of the Mexican Army. In addition to the traditional roles associated with camp maintenance, Salas also reports Mexican women took part in battle.

Another interesting feature is the lack of combat trauma. The projectile embedded in the knee of RES 15 and the cut mark near the elbow of RES 28 are the only injuries directly attributable to the battle. A projectile also was found in the torso area of RES 27, but no skeletal remains were recovered from this region of the body that would indicate trauma. Descriptions from the battle note firearms were not particularly effective because of the dense chaparral undergrowth, but it is difficult to imagine such violent deaths occurred without leaving some evidence in the skeletal remains. No other cut marks or fractures were found that could have resulted from warfare trauma. Edmund Kirby Smith describes the battle of Resaca de la Palma as one of "moral courage" where:

> Our men expected no quarter, and fought with perfect desperation -- it was hand to hand conflict -- a trial of personal strength in many instances, where the bayonet failed, the fist was even used (Smith and Judah 1968:71).

Analyses of skeletal remains from the War of 1812 (Owsley et al. 1991), and the Battle at Little Bighorn (Snow and Fitzpatrick 1989) reveal extensive injuries resulting from battle, and many reports from Resaca de la Palma indicate intense fighting, but the remains from this mass grave provide little evidence of such fighting.

Noteworthy in this particular sample of skeletons is what they reveal about the lives of the people who took part in this battle. Bones provide excellent records of the more important physical events in a person's life: the habitual activities reflected in the development of muscle attachments and arthritis; the chronic diseases and fractures affecting him or her; and the diet of an individual, as indicated by the dentition and chemical analyses of bone. Examination and interpretation of these changes in the skeleton according to the present medical literature describes skeletal biology and pathology, along with ethnographic information on these people. Unfortunately, for this particular population, very little information about their life and behavior exists (see Olivera and Crété 1991). Thus, the skeletons are left to provide the missing details through the interpretation of variation in the remains.

Dental pathology is evident in 6 of the 30 primary burials (20 percent), mainly as small cavities on the molars. The two observed abscesses were found in the remains of females (RES 3 and RES 5), but it is unlikely females would be predisposed to dental pathology any more than the men of a group.

Degenerative lesions are found on 11 (37 percent) of the individuals. While arthritis is associated with the aging process in people, it also reflects physical stress in a person's life. Many of the changes observed in the spine (RES 4, RES 14 and RES 15), as well as the other joints (RES 1 and RES 3), are the result of repeated pressures over a long period of time. However, there are several examples of younger individuals with arthritis: RES 8 (feet); RES 11 (vertebrae); RES 12 (hands); and RES 27 (ankle). All were under 30 years of age, indicating stress from specific activities was placed on these joints. Two of the individuals (RES 3 and RES 11) also have arthritis, probably related to traumatic events that initially weakened the tissues.

The inflammation of bone tissue is apparent in 11 (37 percent) sets of remains. Most of the individuals with periostitis show localized afflictions in the leg bones. This is common in skeletal remains, and probably relates to leg injuries, such as bumping the shin against an object. There is little muscle covering the shin, and a "bruise" to the bone results in skeletal remodeling to repair the damage. There also are several examples of bone tissue inflammation probably related to infections. The older female (RES 1) has lesions on the arm bones as well, which could indicate an infection that spread through the body through the blood vessels, or it could simply be the result of weak connective tissue that covers the bones in an older person. RES 30 also probably had an infection, as the bones of both legs are very swollen, indicating strain from within the bone. As infectious organisms spread and multiply, they produce waste products that create pressure, causing the skeletal tissue to remodel around the infection. Two other individuals (RES 25 and RES 33) exhibit infections in the legs related to fractures. A break in the bone enables microorganisms to get into the inner tissues, where the body's immune system is not as effective.

Trauma provides the most information on the physical nature of peoples lives. Fifteen (50 percent) of the primary burials show some kind of trauma, mainly fractures. As mentioned above, only two injuries are attributable to the battle, so evidently these people led rough lives outside the military. Of the 23 trauma incidents found in the remains, 10 are in the lower limbs. The injuries observed in the feet are of particular interest. Since foot bones are not always recovered, thus less reported, there is little information about prehistoric pathology in the feet. Several fractures (RES 1, RES 24 and RES 28), and the tearing of ligaments in RES 5 and RES 24 show the feet were subject to a very stressful environment, similar to other farming populations where the lack of footwear resulted in increased stress when walking over uneven surfaces, along with draft animals stepping on bare feet (Robert Malina, personal communication 1993). Moving up the skeleton, there also are a couple of knee injuries involving muscle and ligament pulls away from the bone (RES 3 and RES 12), and two healed femur fractures (RES 25 and RES 33), the latter a very difficult bone to break. Also present are two broken noses (RES 11 and RES 13), missing teeth (RES 5), and a head injury (RES 11), all probably associated with personal disputes, if not clumsiness. The fractured mandible from RES 4 also could be related to a previous fight, or a kick from a horse. Two individuals (RES 5 and RES 11) exhibit multiple fractures; for example, RES 5, a female, may have been subjected to physical abuse. All individuals buried in this mass grave died in a violent manner, yet also apparent is that their lives up to that point already included some physical injury and suffering.

The Battle Context of 41CF3

Placement of the mass grave on the battlefield is difficult because very little archeology has been done. The original lines of the armies are not readily apparent. Presumably the current marker noting the battle is approximately on the old road between the resacas, where the Mexican artillery batteries were positioned. 41CF3 is to the west of this central point, away from the road. The soldiers from this mass grave most likely were buried where they fell, and thus indicate the movement of forces in that area during the battle.

Artifacts from 41CF3 reveal the presence of the Mexican Tenth Infantry but, as mentioned earlier, most of the material remains are from irregulars conscripted from local towns. Officers were well equipped, but most of the recruits were not. Many were conscripted "by sending out recruiting detachments" to capture the Indian men for service (Thompson 1846:172). While the officers and regular soldiers wore splendid uniforms and were well provisioned (see Hefter et al. 1958), the *presidiales* and other irregular soldiers lived under poor conditions (Olivera and Crété 1991). According to Waddy Thompson, "drilling consist[ed] mainly in teaching them to march in column through the streets" (1846:173). The lack of training, along with the thick chaparral and terror associated with war, made communication difficult and added to the confusion.

The position of these troops has been noted by several authors (Ramsey 1850; Wilcox 1892). This study is primarily concerned with the left (western) Mexican flank since this is where the mass grave was located. On this side, the Mexican forces initially positioned the famed Guarda Costa of Tampico, along with the Second Light Infantry, the Fourth Infantry and the Regiment of Canales (see Figure 60). The *presidiales* and other irregulars made up the bulk of the reserves directly behind General Arista's camp.

Ramsey provides the most detailed description of Mexican troop movements during the battle, and records that many officers and soldiers on the western flank were killed during the initial assault, and, in retreat, "disconcerted the corps on the right" (1850:52). He states Taylor concentrated on the left flank because it was the weakest part of the line. Also, Barbour (1936:59) notes fighting on the western side was especially difficult "owing to the impenetrable nature of the thicket". The Fourth Infantry was the last line of defense before Arista's camp, but they also were defeated. Mexican forces making up the right flank, including the Tenth Infantry, moved toward the road during the battle to engage the enemy on the left, and other Mexican troops generally headed south to escape the American assault (Wilcox 1892).

This information supports the few identifiable artifacts recovered. The emblem from the Fourth Infantry and the buckle from the Tenth probably came from individuals killed relatively late in the battle since that is when these two battalions engaged the enemy at that approximate location. While the buckle from the Tenth Infantry was not recovered during the archeological investigation, this researcher was told it came from the pelvic area of RES 19 (Michael Collins, personal communication 1993). Possibly some accouterments were taken by U.S. soldiers as war booty. Skeletons with a large number of artifacts associated with irregular troop dress would not have been looted by other soldiers or history buffs with metal detectors, so it may be possible to determine which individual primary burials were not regular Mexican military. Capt. William S. Henry (1847:100) noted "three captains and four lieutenants were buried on the field; and they [Mexican military] acknowledge that forty-eight officers, besides these, are missing". From the historical accounts, it is evident only a few of the dead at Resaca de la Palma were buried hastily, while hundreds more were left on the battlefield.

The disarray of the skeletons in the mass grave is obvious in the incomplete nature of the primary burials, and by the extensive assortment of commingled remains not associated with a particular individual. A minimum number of individuals (MNI) can be determined by noting which bone occurs most frequently in the sample. In this case, there are 28 right femurs and left tibiae. Leg bones are most prevalent in this sample, followed by arm and foot bones. This is less than the number of primary burials (30) assigned by the archeologists and physical anthropologists, probably signifying the separation of individuals into several distinct primary burials.

While the MNI is simply the minimum possible number of remains present, it probably is a more accurate reflection of the true number of people present in this grave, given the excellent preservation of the bones, and the trying circumstances under which the archeology was conducted. It also could be an indication of disturbance shortly after the battle. In 1848, Helen Chapman described another mass grave:

> Further on... we came to a very beautiful spot, a large green open space which was the camping ground of General Arista where all his baggage and booty was found. On the opposite side of the road are two large circular places where the turf has been turned up, and there lie the bodies of those who fell upon the field. Two large pits were dug and into were thrown Americans and Mexicans. On the camping ground of Arista, are three or four graves, two of Sergeants and two, I believe, of Officers whose bodies have since been removed (Coker 1992:29).

The passage indicates the remains of specific individuals were removed after their initial interment. This is not unusual, as the battle site at the Little Bighorn River also had the remains of fallen soldiers disinterred and returned to their families (Scott et al. 1989). At Resaca de la Palma, there also were efforts to recover the remains of certain soldiers. The body of Lt. Richard E. Cochran was buried on the battlefield, and retrieved several months later using a map drawn by Lt. Alexander Hays (in a letter to Cochran's wife, August 7, 1846). A newspaper clipping describes the journey to recover Lt. Cochran, and details the other activities of the doctors:

> Immediately on our arrival [to Resaca de la Palma], we despatched a man to the Palo Alto battlefield to procure us some Mexican skulls -- a few of which we have with us (*York Republican*, December 23, 1846).

Any of these possibilities may explain the jumbled and incomplete nature of the skeletons in the mass grave, resulting either from attempts to locate particular persons, or from the gathering of human remains for "scientific" purposes.

Conclusion

From the skeletal evidence presented above, clearly the remains from this mass grave are not typical of other military samples, either in the number of women present, or the lack of trauma associated with the battle. The pathologies observed in the remains depict a rugged life for the people even before they were in the Mexican military.

The preliminary examination of skeletal remains is complete, but other analyses of the bones, such as chemical composition and radiographs, still need to be done. Further studies on the artifacts, and much more archival research also are needed to complete the account of this battle. Evident from this particular site is that a multidisciplinary approach is essential to truly understanding this mass grave. History, archeology, ethnography and military strategy are all important facets to the story of these soldiers, and there is much more to be done before we can write the final chapter on Resaca de la Palma.

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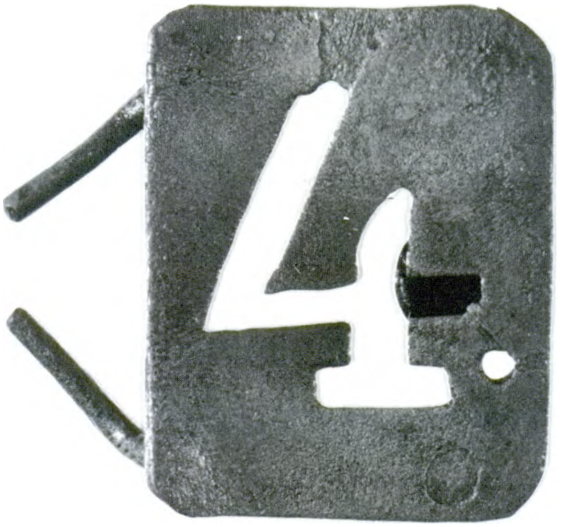

APPENDIX C

Finding a Face:
El Soldado Mexicano
1835-1848

Kevin R. Young, Historian
San Antonio, Texas

Finding A Face: *El Soldado Mexicano*

A leading authority asserted, "history is explicit in recording the words deeds and likeness of political and military leaders of the period, but the Mexican Conscript, the fighting man, remains blurred and forgotten in the background" (Hefter et al. 1958). Thirty-six years later, despite leaps in historical interpretation, this statement remains valid. In monographs, books, research papers, museums and at battlefield parks, the Mexican *soldado* remains the faceless participant in the sweeping history that shaped the fledgling American republics between 1835 and 1848.

Imagination and popular culture shaped conventional wisdom. In this world, the *soldado* emerged as a stereotype serape-clad peon, cowering, yet brutal--unable to act as an individual. Rodolfo Acuna in his work, *Occupied America* characterized the *soldado* as "ill-prepared, ill-equipped and ill-fed", a portrait still presented in current Texas history texts (Acuna 1981). American producers, who traditionally steered clear of the Mexican-American War, have filmed at least sixteen major pictures on the 1836 Texas War and its most famous battle, the Alamo. The *soldado* began in silent films as a cowardly drunkard, often lusting after Anglo-Celtic women. These early treatments fed off a yellow press fostered by the turmoil of the Mexican Revolution. The tradition did not change dramatically until the 1950s when negative portrayals gave way to faceless men who simply became killing machines. Attempts at humanization came in John Wayne's 1960 film, *The Alamo*, a film infamous for its lack of historical accuracy, but important in its attempt to recognize the bravery of the *soldado.*

Generals Ruben Garcia Velazquez de Leon and Jose Domingo Ramirez Garrido, along with Lieutenant-Colonel Alberto Guerra y Portugal were among the few modern Mexican soldiers who attempted to document their predecessors. Yet, two names are preeminent: General Miguel Sanchez Lamego and Joseph Hefter. General Sanchez Lamego penned several historical articles and booklets on early Mexican military history, including the excellent history of the Zapadores Battalion. Two of his best works, one on the 1842 Texas War and another on the Alamo, were published in both Spanish and English (Lamego 1972).

Nevertheless, Joseph Hefter, a German-American mining engineer living in Mexico and the most famous historian of the nineteenth century Mexican soldier, surpassed all previous work. Hefter, along with Angelina Nieto and Mrs. Nicholas Brown, published a small booklet in 1958 titled *El Soldado Mexicano*, a reference to the Mexican Army dating from 1835 to 1848. Because of his limited access to complete documentation, the author admitted in his introduction that the study was far from definitive (Hefter et al. 1958).

The average *soldado* was a draftee. Mexico used conscription as its principal means of recruitment. This system, used by most of the European nations but considered less enlightened by the U.S., was conducted by lottery every October to draw recruits. These recruits were trained at San Luis Potosi or Mexico City. A long list of "professions" excluded many from the draft, and, consequently, those at the bottom of the social-economic ladder ended up in the ranks. A substitute system existed for those who could afford to hire a replacement. Many ill-informed writers suggest large number of "recruits" gathered for the 1836 Texas Campaign. Hefter et al. (1958) allude to more than three thousand conscripts yanked "out of the fields", including prisoners and convicts, for the *Ejercito de Operaciones* against Texas. Battalion returns indicate only a hundred replacements were added to each of the various battalions, and these were trained only rudimentarily. Santa Anna's detailed battle orders for the March 6 assault on the Alamo clearly stated recruits were not to be part of the attacking columns (Lamego 1949). As war with U.S loomed in 1846, recruiters combed the countryside for additional manpower to fill the armies of Mariano Arista and Pedro Ampudia.

The Mexican soldier served lengthy enlistment terms under harsh conditions for low pay. Volunteers served eight years and conscripts 10 years. Deserters generally received additional service time for the first offense, and the second absence added service in coastal garrisons. Because of the yellow fever season, this was far from healthy service. In wartime, apprehended deserters faced execution. Pay for line *soldados* was fifteen *pesos* a month, from which clothing and food allowances were drawn. *Cazadores* in the rifle companies and the *grenaderos* received sixteen *pesos* (Hefter et al. 1958).

The height of Mexican recruits usually was between 64-68 inches (162-173 cm). Additional research in the Mexican Military Archives reveals details such as religion, age, marital status, trade, as well as color of hair, eyes and skin. The Army was racially mixed; most *soldados* had some Indian blood (Hefter et al. 1958). In contrast, one so called "pure" organization was the Active Commerce Regiment of Mexico, whose officer corps and ranks were drawn from the professional community as volunteers and whose men contributed to a unit fund that paid for weapons and uniforms (Hefter et al. 1958). Foreign *soldados* were an exception. Excluding the San Patricio Battalion raised during the Mexican-American War, there were not large numbers of European or North Americans in the ranks, although smaller numbers may have been present. In 1837, some 27 Poles reportedly served in the cavalry of the *Ejercito del Norte*. The San Patricio Battalion, with its Europeans and U.S. Army deserters, made up the largest single grouping of non-Mexicans to serve (Katcher 1976).

The officer corps was alarmingly disproportionate to the rank and file, with some 24,000 officers in 1847 compared to 20,000 *soldados* (Katcher 1976). Many of the senior officers were political chieftains, and their subordinates neither well trained nor disciplined. One British officer found them, "totally ignorant of their duty" (Katcher 1976). In 1833, Mexico established a military academy, but it provided only 100 cadets every three years. The younger officers often provided the leadership needed to inspire the *soldados*, but not all senior officers were unprofessional. At the defeat of Santa Anna's division at the San Jacinto in 1836, General Manuel Fernandez Castrillon refused to turn his back on the enemy. He stood defiantly on an ammunition chest until shot by Texian volunteers. During the same action, Colonel Juan Almonte, realizing the battle was lost, organized some 600 *soldados* and marched them off the field. Keeping them under cover, he waited until the killing stopped and then surrendered, thus sparing his men the fate of their comrades. Colonels Orihuela and Urriza organized the Activos Puebla and Morelia into a rear guard to cover the rout at Resaca de la Guerrero (Palma). General Nicholas Bravo coolly commanded the defenses of Chapultepec in 1847, despite the absence of reinforcements promised by Santa Anna.

Many still believe the Army was overpopulated with foreign officers, and that former Napoleonic Marshalls were used to help recreate a Latin *la Grande Armie* for Santa Anna, the self-styled "Napoleon of the West". A survey of the senior officer corps indicates many of the so-called "foreigners" were old veterans of the War for Independence, who were motivated by social and political advancement. Despite their loyalty to the Mexican Republic, many of the nonnative officers were considered privateers even by their fellows. Their involvement in various political uprisings failed to alter this perception. Out of nine senior staff officers in the 1836 Mexican Army, five were foreign born. Nevertheless, all eleven battalion commanders were native born and the two senior military officers, Secretary of War José Mariá Tornel and General Antonio Lopez de Santa Anna, were native, while the second and third in command, Generals Juan Arago and Vicente Filisola were foreign. When Santa Anna was captured following San Jacinto, field command passed to Filisola since Arago was ill and Tornel had remained in Mexico City. Many of the field commanders believed command of the Army should have passed to division commander and native Jose Urrea. Following the painful evacuation of Texas, Urrea led a heated debate concerning foreign born officers holding command functions. Typically, the debate worked into the power struggle between Federalists and Centralists.

A few Germans served in the officer corps. Included in this group were Adrian Woll, who rose from quartermaster to general, and Juan Holzinger, who served as a colonel in José Urrea's command. Woll commanded the 1842 army that recaptured San Antonio. Jean Berlandier, a Swiss officer, had served in various government offices and helped survey Texas in 1828. He later served as General Arista's chief engineer during the battles of Palo Alto and Resaca de la Palma. At least one U.S. citizen served as a field officer, John "Juan" Davis Bradburn, a former resident of Kentucky who had fought for Mexican independence. Bradburn became infamous to Texas historians for his role in the 1812 disturbances at Anahuac. Davis served in the 1836 Texas War as a colonel, commanding the supply base at Copono.

Between 1835 and 1846, the Mexican Army underwent two organizational changes. Before the Zacatecas Campaign of May, 1835, the *permanente* national army was reorganized from numerical battalions to ones named in honor of the heroes of the Wars of Independence. The national guard, or *activo* regiments were simply organized into battalions. Having seen action in the 1832 to 1834 Federalist-Centralist Wars, both *activo* and *permanente* battalions were veteran units (Hefter et al. 1958).

Battalions were organized into eight companies consisting of some 80 *soldados* each. Rarely were the battalions or even the companies at full strength. Usually, companies stayed at between 34 and 44 effectives. One company was designated as *cazadores* or "light" or "preferred", while a second was designated as *grenaderos*. The *cazadore* company was the light infantry or rifle company used as skirmishers or flankers, while the *grenaderos* consisted of veterans normally used as a reserve. The other six companies were the *fusilero* or the Line or Center companies and did the bulk of the battalion's fighting. The battalion structure was inherited from the Spanish Army following its restructure by the British during the Peninsular War (Hooker 1976).

The Army was reorganized in 1839. One *permanente* and one *activo*, were combined to form a new numerical line infantry regiment. The local militia units were made into battalions, who, along with the coastal guards, were designated to serve as garrison troops. Most, however, would see considerable action as field regiments. In 1841, Mexico created *ligero* or light infantry regiments designed to work as skirmish troops. As campaign losses mounted, light infantry regiments found themselves fighting as regular infantry. Under this system, the Mexican Army fought the Mexican-American War with the U.S. (Hefter et. al 1958). In 1843, a new drill manual by Captain Juan Ordonez was adopted and the following year, Lieutenant-Colonel Jose Lopez Uraga translated the French bayonet drill by Pinette for the Army (Hefter et al. 1958).

Observers criticized the poor marksmanship of the line *soldados*. One critic remarked that one out of ten recruits never saw a musket and only one out of a hundred had actually ever held one (Olivera and Crété 1991). An efficient supply system hampered Mexican marksmanship. One writer noted Santa Anna's 1847 *Ejercito del Norte* had been superficially drilled, and not allowed to target fire their weapons because of the lack of ammunition (Robles 1934). Mexican gunpowder was considered poor by most standards, containing too much sulphur and charcoal. Contemporary accounts from both the Texas Campaign and the Mexican-American War noted Mexican cartridges were often overcharged to give the weapon more punch (Lewis 1950). The result was an intimidating flash in the weapon's pan, stinging cheeks and eyes, and a considerable recoil. U.S. and Texian accounts claimed Mexican troops often fired from the hip to reduce the discomfort of the discharging weapon. In 1839, Texian Ordnance Officer George Hockley commented "the French, the Spaniards, the Mexicans, and some others, fire quickly and from the hip" (Hockley 1839). At the 1842 battle of Lipantitlan, a Texian was amazed as one Mexican sergeant took nearly point blank aim at him, only to turn his head before firing, causing the shot to go high (*Telegraph and Texas Register 1842*). Nevertheless, *cazadores* were competent marksmen, as Texians at the 1835 battle of Bexas could attest. For example, a shot from *cazadore*

Felix de la Garza of the Morelos Battalion killed Texian leader Ben Milam (Creed 1935). Mexican ordnance officers occasionally issued the wrong ammunition. Such foul-ups occurred in all armies, but this fact provided scant comfort to those *soldados* issued Brown Bess ammunition for their Baker Rifles during the 1847 battle of Churubusco (Hefter et al. 1958).

Mexico's cavalry seemed better prepared. The legacy of horsemanship, dating back to the tough *presidial* lancers of the colonial period and the frontier ranching traditions, produced a thriving horse culture, reflected in the large numbers of cavalry units. Cavalrymen were designated as regular line units and irregular auxiliaries, primarily made up of local rancheros. Arms for the cavalry consisted of a wide variety of *escopetas* (short-barreled carbines), swords, *espada anchas* (short swords), lariats and the lance. The lance was the deadliest and most reliable weapon a horse soldier could carry. In several engagements, lancers almost proved fatal to the Americans, armed with swords and single shot pistols. Indeed, the first skirmish of the Mexican-American War was a Mexican victory, secured by excellent light cavalry tactics. Texians developed a healthy respect for Mexican cavalry. In the 1835-1836 Texas War, Mexican regular cavalry swept the field at Agua Dulce and Encinal del Perdido. They also performed swift and almost decisive service in the skirmish of April 20, 1836 at the San Jacinto. Only at the siege of Bexar, where frontier *presidial* companies fought as defending infantry and at the San Jacinto on April 21, where the cavalry found themselves unsaddled and walking their horses to water, did the Texians succeed against Mexican cavalry. During the nine years of hostilities between Texas and Mexico, the Texians developed a system of mounted tactics to deal with Mexican cavalry (Hefter et al. 1958).

Most of Mexico's cavalry units were "light" (small men on small horses). The *Tulacingo Cuirassiers*, created in 1842, were the only true heavy cavalry regiment in Mexican service. Accounting for much of the success of the Mexican cavalry were a series of capable field commanders, including Generals Anastasio Torrejón and Jose Urrea.

Mexican officers normally deployed their artillery as a complete corps. No individual or battalion designations were used until before the Mexican-American War when the National Guard, created by Gomez Farias, designated artillery regiments and batteries. The Mexican Artillery Corps contained some of the better educated and trained *soldados*, but was hampered by poor equipment. The guns were heavy, and not easily transported. When in defensive positions, Mexican cannon could be quite effective, but on the offensive they became more of a hindrance than a help. Senior officers appeared ignorant of how best to use the corps. Mexican military science did not allow the artillery to experiment with new techniques, while the U.S. had developed light artillery pieces and tactics. The results, particularly at Palo Alto, were devastating for the Mexican military. Perhaps the most professional element of the Army was the *Zapadores* or engineers. This battalion played a major role in every military engagement during this period except at San Jacinto, and were often used as reserves with the grenadiers.

The appearance of the Mexican Army evoked the Napoleonic dress. The *soldado* wore a wool tail coat, cut at the waist, with wool pants. Facings, on sleeves and collars, depended on regiments and branch of service. The standard Mexican headgear was a shako. During the 1830s, it was bell crowned and, after 1839, was cylindrical and made of leather or felt. Shakos were designed not merely for a military appearance, but as protection against sword blows and the elements. Some units received a canvas summer or canvas tropical white uniform, and, in many cases, they wore combinations of this uniform and the wools. While brogans or shoes were issued, many soldiers preferred sandals or to go barefoot on the march (Hefter et al. 1958; Katcher 1976; Haythornthwaite 1986). Uniform manufacture took place in Mexico at the textile mills in Queretaro, Puebla and Mexico

City. During the reorganization of the *Ejercito del Norte* by Santa Anna in 1847, clothing and equipment were produced at special factories established at San Luis Potosi.

One lecturer insisted the Mexican Army bought their uniforms directly from France. Regulations, which state the coat shall be of Queretero cloth, do not support such a claim, and although the style was "Napoleonic" it was not necessarily French. The same source also stated the accouterments were purchased from France. Since Mexicans were using .75 caliber weapons, it would be almost impossible to use a cartridge box made for French .69 caliber weapons. Scholars and history buffs hotly debate the nature of Mexican uniforms. Hefter et al. recreated the plates for *El Soldado Mexicano* using originals and period regulations. A series of color lithographs produced by Claudio Linati illustrate a shako, circa 1828, with a red-white-green "bull's eye" on top and high military wings on the service uniforms. These early drawings influenced the popular cultural view of the Mexican uniform, as almost every Hollywood film shows either this or the presidial lancer uniform, despite Hefter's research and the 1835 painting "The Battle of Tampico" by Manuel de Paris. Currently, there are no known photographs of Mexican troops during the Mexican-American War.

The care of the sick and wounded *soldados* was a concern of the Government following the disastrous 1836 Texas War, when hundreds suffered needlessly from lack of a proper medical corps. Santa Anna retained the services of a North American doctor on the march from Saltillo, but the doctor later died. The battle of the Alamo turned San Antonio into a garrison field hospital, and the commandant, General Juan Andrade, urgently requested "medical supplies, bandages, thread and medical herbs" as well as an "efficient doctor" (Andrade 1852). Andrade was forced to look elsewhere for medical assistance, bringing three U.S. surgeons spared from the Goliad Massacre to assist. Upon arriving in Bexar one of them observed the "[The Mexican] surgical department is shockingly conducted, not an amputation performed before we arrived...there has been scarcely a ball cut out as yet, almost every patient carrying the lead he received" (Barnard 1912).

A Military Health Corps was established in August of 1836, followed by a Central Military Hospital system in 1837. The Corps had facilities in Vera Cruz, Tamaulipis, San Luis Potosi and Chihuahua. Ernest Friedrich Adolf Hegewisch, a German serving as the chief of the new corps, made steady improvements despite constant shortages (Hefter et al. 1958).

Aside from wounds received on the battlefield, the *soldado* faced the usual variety of illnesses associated with the nineteenth century military brought on by bad hygiene, fouled water and spoiled rations. Spotted itch, dysentery and yellow fever constantly reduced ranks. Rations in the 1836 Texas War consisted of hardtack, corncakes, beans and flour, and a supplement of meat, which one officer noted was "of poor quality, dry and not very nutritious and even harmful" (Filisola 1985). Like most armies, the Mexican army quickly learned to live off the land, but even this was hampered by ongoing late payment for field troops. General Ramirez y Sesma, commanding the vanguard division of the 1836 *Ejercito de Operaciones* was so pressed for fresh supplies and currency that he confiscated food stuffs from the villas and haciendas on his route. The division following found inhabitants angry at his impressment (Filisola 1985). During the 1847 march from San Luis Potosi to Satillio, *soldados* in the *Ejercito del Norte* faced a shortage of both food and water. The answer to this problem was that water would be obtained after the army defeated the Americans, and that new rations would be secured from captured American stores.

In addition to the ration situation, the elements often conspired to increase the misery of the *soldado*. On the march into Texas, snow fell on northern Mexico. With only blankets and their uniform tunics for protection many *soldados* succumbed to the worsening conditions. General Urrea's division, advancing north from Matamoros, also encountered freezing weather. Particularly unaccustomed to the ice and snow were the Mayan Indians of the *activo* Yucatan and the *soldados* of the *Tres Villas Battalion.* Similar experiences were shared during the winter of 1847 by the *Ejercito del Norte* when Santa Anna marched north from San Luis Potosi to intercept Zachary Taylor's command at Saltillo.

Where the government failed, individual initiative took over. The *soldadera* or female camp followers helped to supplement rations. A *chusmas* or mob of such women, often with children, marched with the Mexican military, much to the displeasure of several ranking officers, including General Filisola. These women provided "home-services", which included more than just physical activities. They secured clothing and extra rations, mended and cleaned equipment, and prepared meals. While many *soldaderas* were wives, others were less legitimate. Officers also brought *soldaderas* along. Perhaps the most famous was the mistress of Captain Telesforo Alavez of the Cuautla Dragoons. Known as "Panchita", during the 1836 Texas War she used her position to intervene and help save at least 99 Texian prisoners from execution, earning the title, "The Angel of Goliad" (O'Connor 1966). Other *soldaderas* were to become legends. For example, Maria Josefa Zozaya took water to wounded soldados during the 1846 battle of Monterrey until she was killed by U.S. fire. She earned the title, "The Maid of Monterrey". Maria de Jesus Dosamantes, a 25-year old *soldadera,* actually served as a soldier in General Pedro Ampudia's army (Salas 1990). *Soldaderas* were a tough, resourceful lot, and often paid for their unofficial status with their lives. A *soldadera* prisoner was stabbed to death by a vengeful Colonel John Forbes at San Jacinto, and archeological investigations of a burial trench at Resaca de la Palma battlefield indicate a number of female remains mixed among the *soldados.*

Mexican soldiers demonstrated commendable courage and remarkable ruggedness. Critics often assert the *soldado* did not have the stomach to fight, and exposure to prolonged combat produced instant morale problems and desertion. One foreign observer noted that Mexicans could not manage a bayonet assault (Olivera and Crété 1991). He obviously did not witness Major Juan Andonaigui's 1832 bayonet charge at Tolome, or the battle of the Alamo, which was not only a bayonet assault, but executed at dawn by the *permanente* Battalions Matamoros, Jimenez and Aldama, the *activos* of San Luis, and Toluca supported by the Zapadores. Bravery was a common trait among *soldados.* The Mexican line regiments at Palo Alto withstood a terrible pounding as their cavalry tried to outflank the U.S. light artillery. Several Mexican standard bearers were wounded or killed trying to save battalion standards. Sub-Lieutenant José Maria Torres of the Zapadores was mortally wounded while raising the Jimenez colors over the Alamo; Captain Suajo of the Mina Battalion, although severally wounded, saved his battalion's standard by wrapping it around his waist at Molino del Rey. Under U.S. artillery fire, First Lieutenant of the Marine Sebastian Holzinger mounted the parapet of the Battery Santa Barbara and nailed the national standard to the staff during the 1847 bombardment of Vera Cruz. The last stand of the *Niños* at Chapultepec and the *Activo* San Blas attest to the individual heroics and courage of the soldados. Unlike the United States, Mexico rewarded its troops with medals and badges for military service. These included the "Star of Texas" for the 1835 to 1836 campaigns as well as service medals for Lipantitian, the Defense of Mier, the Defense of Tampico, Palo Alto, Buena Vista and Chapultepec (Perez-Maldonado 1942).

Like most armed forces, the Mexican Army had its share of infamous moments. The rout of the *Ejercito del Norte* following the defeat at Resaca de la Guerrero (Palma) mirrored similar incidents at San Jacinto and Cerro Gordo. The collapse of organized resistance, particularly when the officer corps abandoned the fight, created a massive morale problem among the *soldados,* who often simply threw down their weapons and equipment and fled the field. This not only halted resistance but often created conditions that greatly contributed to casualties. The rout of Santa Anna's division by the Texian forces pushed many *soldados* into an impassable lake, where they bogged down, then were slaughtered by vengeful Texians. Following the defeat at Resaca de la Guerrero (Palma) in 1846, elements of the Army of the North literally drowned trying to cross the Rio Grande (Alcaraz 1850).

National policies often made the *soldado* the instrument not only of a military campaign, but jailer and executioner. Perhaps nowhere was this more keenly felt than the 1836 Texas War. In the initial phases of this war, Mexican and Texian forces treated each other's prisoners with due consideration, particularly following the defeat of General Cos at San Antonio. His forces were paroled and allowed to retire under arms and with provisions to the Rio Grande. The conflict took a different turn in 1836. Alarmed at the large number of U.S. volunteers immigrating to assist the Texian colonists, the Mexican Congress passed the Tornel Decree, which ordered anyone who was not a Mexican citizen and who was captured on Mexican soil under arms, to be treated as a pirate and dealt with accordingly. The Decree did not find its way into U.S. and Texian newspapers until March of 1836, and most fighting in Texas were not aware of it. Nevertheless, Santa Anna used it to execute the surrendered garrison of Goliad, despite reassurances to the prisoners they would be paroled. Combined with the earlier massacre at the Alamo, the decree had the reverse effect. Regardless of its repeal in April, the decree and its enforcement made the entire civilized world regard the Mexican nation and its Army as "savages". The Texian army smashed Santa Anna's division at San Jacinto, slaughtering more than 600 *soldados*. Combative relations between the Mexican military and the Texians remained brutal well into the Mexican-American War, and, fueled by later events, such as the 1842 Dawson Fight and the execution of the Texian prisoners taken at the invasion of Mier. In the Mexican-American War, Mexican lancers were often accused of being brutal to wounded Americans, but many of these crimes actually may have been committed by the mounted irregular forces used during the war. Mexican cavalry manuals of the 1840s carried the bugle call, *El Deguello*, which was to be blown at the climax of a cavalry charge to signify no quarter to the enemy. Some traditional accounts state the *deguello* also was sounded during the Alamo assault (Potter 1860).

The creation of the Palo Alto Battlefield NHS opens an entirely new opportunity for study of the Mexican *soldado* on both sides of the Rio Grande. It also provides us with a chance to interpret and commemorate his service. Perhaps as researchers are able to explore newly recovered evidence they may at last pull the Mexican *soldado* from the shadows, exposing him to the light of historical research and at last be able to see the features of his face.

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INDEX

Aiken, Col. Bruce, 41
Alamo, the, 58,134,210,214-215
Allen, Maj. George, 24
American Revolutionary War, 74,140
Ampudia, Gen. Pedro de, 19,20,22, 23,26,34,210
Arista, Gen. Mariano, 19,20-26,31-34, 36,37,41; at Resaca de la Palma, 203-204
Arista Hill, 93,104,151-152,154
army, definition of, 6;
  Arista's, 6,20,22-23,26,36-38, 88,92,190
  Taylor's, 17-19,23,26,37-39,41, 88,92,190,215
Army, Regular, definition of, 6
  Army of U.S., 17-18,40,70,92,108; regular soldiers in, 70-71
  Army of Mexico, 18,40,45,59,92, 210-212; regular soldiers in, 71-74, 210-218
Arsenal, Mexico, 109
Arsenals, U.S.
  Frankford, 108
  St. Louis, 108
  Watervliet, 108
artillery, Mexican: 20,22,23-26,33-34, 68-69,153; used at Palo Alto, 20,24, 60, 68,89,93,95; copper shot for, 97,103-104,119-120; 4-pdrs., 26,31,32,34,68,69; 8-pdrs., 26,68,69
  U.S.: 17,22-24,31,33,36,41,60,65-67, 153; used at Palo Alto, 60,65,88, 95; 6-pdrs.,17,22,26,65,67,90,96, 117,121,153; 12-pdrs., 17,26,37, 65,67,96,117,121;18-pdrs.,22-24, 26,31,33,34,37,40,66,67,88,90 93,96,117,141,144,153
Artillery Battalion, 17,24,31,34,88,93,119
Belknap, Lt. Col. William, 24,38,71
Berlandier, Capt. Jean Louis, 33,78,212; battle maps by,78-85,94
Blake, Lt. Jacob, 24,39
Bliss, Maj. William W.S., 77
Bragg, Capt. Braxton, 66
briquet, 29,30,59; hilt of,129-130
British East India Company, 45,48
Brown, Maj. Jacob, 22
Brownsville, 1,3,40,140,192
Buena Vista, battle of, 66
California, 18
Cameron County, 3,11
Canales, Gen. Antonio, 20,24,26,88,203
canister, 34,38,39,61,64,66,95,96,109,118, 151
carbine, Colt, 57; Hall, 55,96; Jenks, 57; Paget, 48, part of a, 125-126,154
cavalry, Mexican, 24,26,31,33,34, 36,66,81,92-93,96,103,213
  7th Cavalry, 19,24,34
  8th Cavalry, 20,24
  2nd Light Cavalry, 36
cazadores, 26-28,211; as marksmen, 212-213
Champion, A.A., 41
Chapman, Helen, 190
Chapultepec, battle of, 211
Chapultepec Military College (Mex.), 68
Childs, Lt. Col. Thomas, 24,334
Churchill, Lt. William, 24,31,33,34
Civil War, 1,4,136,140; battlefields of, 109,114
Cochran, Lt. Richard E., 204
Comanches, 40
Cooke, Capt. Philip St. George, 55
cordgrass (Spartina), 14,15,23,27,40, 101,104,152-153
Corpus Christi, 17,18,19
Cross, Col. Trueman, 19
deserters, U.S., 71,211
Díaz, Porfirio, 1
Díaz de la Vega, Gen. Rómolo, 26
Dobbins, Lt. S.D., battle maps by, 85, 90-91,94
dragoons, 17,19,24,33,34,41,55,58, 113,153
Duncan, Capt. James, battery of, 24,26, 33,34,36,81,88,90,115,117,122,136, 139,151,153
El Camino de los Indios, 23
El Camino de Santa Isabel, 23
El Tule Grande, 23

- *escopeta*, 32,48,96,213
- Federalists-Centralists Wars, 211-212
- field hospital, Mexican, 31,36,153,214
- Forts
  - Brown, 39,40
  - Guerrero, 19
  - Jesup, 17,58
  - Munroe, 66
  - Polk, 19,22
  - Stanwix, 132
  - Texas, 19,20-22,36
- France, 45; suppliers to Mexico, 214
- French, Lt. Samuel, 33
- Frontón de Santa Isabel, 19
- *fusilero*, definition of, 212
- Grant, Lt. Ulysses S., 31,36,117
- grapeshot, 66,96,116,118-119
- Great Britain, 45
- *grenaderos*, 211
- guerrillas, Mexican, 19
- gun, artillery, definition of, 67
- Hawkins, Maj. E.S., 22
- Hays, Lt. Alexander, 204
- Henry, Capt. W.S., battle maps by, 38,85, 90-91,94
- Herrera, José Joaquín de, 18
- howitzer, definition of, 67; used at Palo Alto,117
- infantry regiments, Mexican
  - 1st, 19,26,29,30,137-138
  - 4th, 20,26-29,33,92-93,137
  - 6th, 26-28,34,137,139
  - 10th, 19,26,137-138
  - 2nd Light, 19,20,24,26,34,81,92,154
- infantry regiments, U.S.
  - 3rd, 24,26,32,33,92-93
  - 4th, 24,26,33,34,54,136
  - 5th, 23,24,26,31-34,41,92-93,120
  - 8th, 24,26,31,34,92,139
- irregulars, Mexican, 20,26,85,88
- Ker, Capt. Croghan, 24,34
- La Palangaña, 20
- *ligero*, definition of, 212
- Little Bighorn, battle of, 4,5,202,204
- Longoria, Dr. Vidal, 41
- Lower Rio Grande Valley (LRGV), 7,15, 16,41,92
- Martinez, Felipe, 38
- Matamoros, 1,2,19,20,23,36,214
- Maximillian, Emperor of Mexico, 1
- May, Capt. Charles, dragoon squadron of, 24,33,34,93,119-120
- McIntosh, Col. James, 24,33,71,117,120
- Meade, Lt. George Gordon, 36,71
- Meir, battle of, 57
- Mejía, Gen. Francisco, 19,20,78
- Mendevil, José Mariá Tornel y, 19
- Mexican-American War, 1,4,17,45,55,57, 64,66,68,70,72,77,95,108,115,117, 136, 155,210,212
- Mexican Revolution, 210
- Mexican soldier, the, 210-218
- Mexico, 1,17,18,45,60,71,109,134,140,155
- Mexico City, 18,19,210-214
- Mills, Army Surgeon Madison, 38
- Minié balls, 109,110,114
- Mississippi Volunteers, 57
- Monterrey, battle of, 97
- Montero, Col. Cayetano, 26,34
- Montgomery, Capt. William, 24
- Mordecai, Capt. Alfred, 51,54
- Morris, Capt. Lewis, 24
- mortar, definition of, 67
- *motitas*, 11,26,81,92-94,151-152
- Munroe, Maj. John--19,20
- musket, 45
  - India Pattern (Br.), 29,30,45-47,58,96-97,109; parts of,122-129,154; lead ball for, 110
  - Short Land Pattern (Br.), 47
  - New Land Service (Br.), 47
  - Model 1763 (Fr.), 107
  - Model 1795 (U.S.), 107
  - Model 1816/1822 (U.S.), 51,52,55,58
  - Model 1822 (Fr.), 51
  - Model 1835 (U.S.), 51,53,58,96
  - Model 1841 (U.S.), 96
- Napoleonic Wars, 45,47,48,72,74,76,109
- National Audubon Society, 7
- National Park Service, 1,4,5,95
- New Mexico, 18,131
- Noriega, Col. Luis, 36
- Nueces River, 17
- Ordnance Dept., 54
- Page, Capt. John, 34
- Palo Alto, battle of, 1-5,7,19-23,36,39, 40,42,58,66-67,71,76,95,151-155; soils, 8,9,11; wetlands, 8,10; vegetation, 11-13,93-94; wildlife;15,16; pond;10,19,23-24,40,

89,92,152,155; House, 39,155
Paredes, General Mariano, 18,19
Parker, Gen. James, 40,41
Peña de Peña, Manuel de, 18
pistols, 48-50,57
Pierce, Judge Frank C., 41
Plitt, Walter III, 43,105
Point Isabel, 19,20-22,57
Point Isabel-Matamoros Road, 19-22,39, 81,88,92,117,152
Polk, President James E., 17,18
Porter, Lt. Theodoric, 19
presidiales, 20,24,31,72,203,213
Puebla Battalion, 22
Rancho de Carricitos, 20
Rancho de Longoreño, 20
Republic of Texas, 71
resaca(s), 7,10,14,23,31,78,88,152
Resaca de la Palma, 3,37-39,40,71,78,122, 211; artifacts from, 129; mass burial at, 190-207
Resaca de Palo Alto, 10,11,14,23,92,152, 155
Ridgely, Lt. Randolph, 33
rifles, 33,76
    Baker, 27,28,47,58; lead ball for, 110,140-141
    Hall, 54-56,57,108; lead ball for, 110
    Jenks, 57
    "Kentucky", 57
    "Mississippi", 57
Ringgold, Maj. Samuel, battery of, 23,26,31, 33, 34,39,41,66,67,93,115,117
Rio Grande, 3,7,17,18,19,22,23,155
round/solid shot, 26,34,60-63,96,120-122
San Jacinto, battle of, 211,213,216
San Luis Potosi, Mexican supply base of, 210,214
San Patricio Battalion, 211
Santa Anna, Antonio López de, 1,40,58,211
Scarritt, Lt. Jeremiah, 37,115; battle sketch maps by, 88-91
Seminole War, 57,59
shell, 31,34,62,64,115-118
Slidell, Senator James, 18
Society of Historical Archaeology, 4
soldaderas, at Resaca de la Palma, 195-197,201,212
spherical case, 32,34,38,63,64,95,96,109, 115-118
tactics, types of, 74-76
Tampico Coastal Guards, 34,203
Tanques de Ramireño, 22,23; road to Palo Alto, 92-93
Taylor, Gen. Zachary, 17-20,22-24,26,31, 33,36,37,66,71,190
Texas, 7,17-18
Texas Navy, 57
Texas Rangers, 20,22-23,33,57
Texas Volunteers, 70,93,211
Texas War, 210-213
Thornton, Capt. Seth, 20
Tilghman, Lloyd, 24
Topographical Engineers, 18,24,78
Torrejón, Gen. Anastasio, 19,24,31-34,93, 113
Totten, Col. J.G., 88
Twiggs, Gen. David, 23,31,71
University of Texas/Brownsville, 7
United States, 1,17,18,60
U.S. Fish and Wildlife, 13
U.S. House of Representatives, 20
vara, 6,111
Vásquez, Gen. Ciriano, 73
wagon/baggage train, U.S.: 6,22-24,34, 36,88,92,144,190; fortification of, 37,40,115;
    Mexican: 26,36,153
Walker, Capt. Samuel, 20,23,33
War Department, 68
War of 1812, 71,136
West Point Military Academy, 18,66,71, 117,122
Worth, Col. William Jenkins, 19,71
Worth's Camp, 18,88,89,92,155
zapadores, 19,26,34,210,213

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INDEX

Aiken, Col. Bruce, 41
Alamo, the, 58,134,210,214-215
Allen, Maj. George, 24
American Revolutionary War, 74,140
Ampudia, Gen. Pedro de, 19,20,22, 23,26,34,210
Arista, Gen. Mariano, 19,20-26,31-34, 36,37,41; at Resaca de la Palma, 203-204
Arista Hill, 93,104,151-152,154
army, definition of, 6;
  Arista's, 6,20,22-23,26,36-38, 88,92,190
  Taylor's, 17-19,23,26,37-39,41, 88,92,190,215
Army, Regular, definition of, 6
  Army of U.S., 17-18,40,70,92,108; regular soldiers in, 70-71
  Army of Mexico, 18,40,45,59,92, 210-212; regular soldiers in, 71-74, 210-218
Arsenal, Mexico, 109
Arsenals, U.S.
  Frankford, 108
  St. Louis, 108
  Watervliet, 108
artillery, Mexican: 20,22,23-26,33-34, 68-69,153; used at Palo Alto, 20,24, 60, 68,89,93,95; copper shot for, 97,103-104,119-120; 4-pdrs., 26,31,32,34,68,69; 8-pdrs., 26,68,69
  U.S.: 17,22-24,31,33,36,41,60,65-67, 153; used at Palo Alto, 60,65,88, 95; 6-pdrs.,17,22,26,65,67,90,96, 117,121,153; 12-pdrs., 17,26,37, 65,67,96,117,121;18-pdrs.,22-24, 26,31,33,34,37,40,66,67,88,90 93,96,117,141,144,153
Artillery Battalion, 17,24,31,34,88,93,119
Belknap, Lt. Col. William, 24,38,71
Berlandier, Capt. Jean Louis, 33,78,212; battle maps by,78-85,94
Blake, Lt. Jacob, 24,39
Bliss, Maj. William W.S., 77
Bragg, Capt. Braxton, 66
briquet, 29,30,59; hilt of,129-130
British East India Company, 45,48
Brown, Maj. Jacob, 22
Brownsville, 1,3,40,140,192
Buena Vista, battle of, 66
California, 18
Cameron County, 3,11
Canales, Gen. Antonio, 20,24,26,88,203
canister, 34,38,39,61,64,66,95,96,109,118, 151
carbine, Colt, 57; Hall, 55,96; Jenks, 57; Paget, 48, part of a, 125-126,154
cavalry, Mexican, 24,26,31,33,34, 36,66,81,92-93,96,103,213
  7th Cavalry, 19,24,34
  8th Cavalry, 20,24
  2nd Light Cavalry, 36
cazadores, 26-28,211; as marksmen, 212-213
Champion, A.A., 41
Chapman, Helen, 190
Chapultepec, battle of, 211
Chapultepec Military College (Mex.), 68
Childs, Lt. Col. Thomas, 24,334
Churchill, Lt. William, 24,31,33,34
Civil War, 1,4,136,140;
  battlefields of, 109,114
Cochran, Lt. Richard E., 204
Comanches, 40
Cooke, Capt. Philip St. George, 55
cordgrass (Spartina), 14,15,23,27,40, 101,104,152-153
Corpus Christi, 17,18,19
Cross, Col. Trueman, 19
deserters, U.S., 71,211
Díaz, Porfirio, 1
Díaz de la Vega, Gen. Rómolo, 26
Dobbins, Lt. S.D., battle maps by, 85, 90-91,94
dragoons, 17,19,24,33,34,41,55,58, 113,153
Duncan, Capt. James, battery of, 24,26, 33,34,36,81,88,90,115,117,122,136, 139,151,153
El Camino de los Indios, 23
El Camino de Santa Isabel, 23
El Tule Grande, 23

escopeta, 32,48,96,213
Federalists-Centralists Wars, 211-212
field hospital, Mexican, 31,36,153,214
Forts
    Brown, 39,40
    Guerrero, 19
    Jesup, 17,58
    Munroe, 66
    Polk, 19,22
    Stanwix, 132
    Texas, 19,20-22,36
France, 45; suppliers to Mexico, 214
French, Lt. Samuel, 33
Frontón de Santa Isabel, 19
fusilero, definition of, 212
Grant, Lt. Ulysses S., 31,36,117
grapeshot, 66,96,116,118-119
Great Britain, 45
grenaderos, 211
guerrillas, Mexican, 19
gun, artillery, definition of, 67
Hawkins, Maj. E.S., 22
Hays, Lt. Alexander, 204
Henry, Capt. W.S., battle maps by, 38,85, 90-91,94
Herrera, José Joaquín de, 18
howitzer, definition of, 67;
    used at Palo Alto,117
infantry regiments, Mexican
    1st, 19,26,29,30,137-138
    4th, 20,26-29,33,92-93,137
    6th, 26-28,34,137,139
    10th, 19,26,137-138
    2nd Light, 19,20,24,26,34,81,92,154
infantry regiments, U.S.
    3rd, 24,26,32,33,92-93
    4th, 24,26,33,34,54,136
    5th, 23,24,26,31-34,41,92-93,120
    8th, 24,26,31,34,92,139
irregulars, Mexican, 20,26,85,88
Ker, Capt. Croghan, 24,34
La Palangaña, 20
ligero, definition of, 212
Little Bighorn, battle of, 4,5,202,204
Longoria, Dr. Vidal, 41
Lower Rio Grande Valley (LRGV), 7,15, 16,41,92
Martinez, Felipe, 38
Matamoros, 1,2,19,20,23,36,214
Maximillian, Emperor of Mexico, 1
May, Capt. Charles, dragoon squadron of, 24,33,34,93,119-120
McIntosh, Col. James, 24,33,71,117,120
Meade, Lt. George Gordon, 36,71
Meir, battle of, 57
Mejía, Gen. Francisco, 19,20,78
Mendevil, José Mariá Tornel y, 19
Mexican-American War, 1,4,17,45,55,57, 64,66,68,70,72,77,95,108,115,117, 136, 155,210,212
Mexican Revolution, 210
Mexican soldier, the, 210-218
Mexico, 1,17,18,45,60,71,109,134,140,155
Mexico City, 18,19,210-214
Mills, Army Surgeon Madison, 38
Minié balls, 109,110,114
Mississippi Volunteers, 57
Monterrey, battle of, 97
Montero, Col. Cayetano, 26,34
Montgomery, Capt. William, 24
Mordecai, Capt. Alfred, 51,54
Morris, Capt. Lewis, 24
mortar, definition of, 67
motitas, 11,26,81,92-94,151-152
Munroe, Maj. John--19,20
musket, 45
    India Pattern (Br.), 29,30,45-47,58,96-97,109; parts of,122-129,154; lead ball for, 110
    Short Land Pattern (Br.), 47
    New Land Service (Br.), 47
    Model 1763 (Fr.), 107
    Model 1795 (U.S.), 107
    Model 1816/1822 (U.S.), 51,52,55,58
    Model 1822 (Fr.), 51
    Model 1835 (U.S.), 51,53,58,96
    Model 1841 (U.S.), 96
Napoleonic Wars, 45,47,48,72,74,76,109
National Audubon Society, 7
National Park Service, 1,4,5,95
New Mexico, 18,131
Noriega, Col. Luis, 36
Nueces River, 17
Ordnance Dept., 54
Page, Capt. John, 34
Palo Alto, battle of, 1-5,7,19-23,36,39, 40,42,58,66-67,71,76,95,151-155;
    soils, 8,9,11; wetlands, 8,10;
    vegetation, 11-13,93-94;
    wildlife;15,16; pond;10,19,23-24,40,

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89,92,152,155; House, 39,155
Paredes, General Mariano, 18,19
Parker, Gen. James, 40,41
Peña de Peña, Manuel de, 18
pistols, 48-50,57
Pierce, Judge Frank C., 41
Plitt, Walter III, 43,105
Point Isabel, 19,20-22,57
Point Isabel-Matamoros Road, 19-22,39, 81,88,92,117,152
Polk, President James E., 17,18
Porter, Lt. Theodoric, 19
presidiales, 20,24,31,72,203,213
Puebla Battalion, 22
Rancho de Carricitos, 20
Rancho de Longoreño, 20
Republic of Texas, 71
resaca(s), 7,10,14,23,31,78,88,152
Resaca de la Palma, 3,37-39,40,71,78,122, 211; artifacts from, 129; mass burial at, 190-207
Resaca de Palo Alto, 10,11,14,23,92,152, 155
Ridgely, Lt. Randolph, 33
rifles, 33,76
  Baker, 27,28,47,58; lead ball for, 110,140-141
  Hall, 54-56,57,108; lead ball for, 110
  Jenks, 57
  "Kentucky", 57
  "Mississippi", 57
Ringgold, Maj. Samuel, battery of, 23,26,31, 33, 34,39,41,66,67,93,115,117
Rio Grande, 3,7,17,18,19,22,23,155
round/solid shot, 26,34,60-63,96,120-122
San Jacinto, battle of, 211,213,216
San Luis Potosi, Mexican supply base of, 210,214
San Patricio Battalion, 211
Santa Anna, Antonio López de, 1,40,58,211
Scarritt, Lt. Jeremiah, 37,115; battle sketch maps by, 88-91
Seminole War, 57,59
shell, 31,34,62,64,115-118
Slidell, Senator James, 18
Society of Historical Archaeology, 4
soldaderas, at Resaca de la Palma, 195-197,201,212
spherical case, 32,34,38,63,64,95,96,109, 115-118
tactics, types of, 74-76
Tampico Coastal Guards, 34,203
Tanques de Ramireño, 22,23; road to Palo Alto, 92-93
Taylor, Gen. Zachary, 17-20,22-24,26,31, 33,36,37,66,71,190
Texas, 7,17-18
Texas Navy, 57
Texas Rangers, 20,22-23,33,57
Texas Volunteers, 70,93,211
Texas War, 210-213
Thornton, Capt. Seth, 20
Tilghman, Lloyd, 24
Topographical Engineers, 18,24,78
Torrejón, Gen. Anastasio, 19,24,31-34,93, 113
Totten, Col. J.G., 88
Twiggs, Gen. David, 23,31,71
University of Texas/Brownsville, 7
United States, 1,17,18,60
U.S. Fish and Wildlife, 13
U.S. House of Representatives, 20
vara, 6,111
Vásquez, Gen. Ciriano, 73
wagon/baggage train, U.S.: 6,22-24,34, 36,88,92,144,190; fortification of, 37,40,115;
  Mexican: 26,36,153
Walker, Capt. Samuel, 20,23,33
War Department, 68
War of 1812, 71,136
West Point Military Academy, 18,66,71, 117,122
Worth, Col. William Jenkins, 19,71
Worth's Camp, 18,88,89,92,155
zapadores, 19,26,34,210,213

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